February 12, 2004

Mr. Billy D. Causey
Superintendent
Florida Keys National Marine Sanctuary, US Department of Commerce
National Oceanic and Atmospheric Administration
Florida Keys National Marine Sanctuary
PO Box 500368
Marathon, FL 33050

RE: USS Hoyt Vandenberg Artificial Reef Project
FKNMS-2003-79

Dear Mr. Causey:

This letter is in response to your letter dated December 16, 2003. We appreciate the ongoing cooperation of the FKNMS in their permitting process for this project.

Our responses are as follows.

Item 1: Project Goals, timeline and proponent –
Detailed information on the goals and criteria for the proposed action as opposed to alternates is presented in the Draft Environmental Assessment, which is Attachment 6 to this letter. A summary of this information is as follows.

The direct goals for this project are to create a world-class artificial reef that will divert users (diving and fishing) from the natural reefs and toward the artificial reef as well as to provide the City of Key West with an eco-tourism attraction that will provide socioeconomic benefits to the City, residents and businesses. This artificial reef will be a platform for ecological marine research, training and educational initiatives, which will provide a tool for a greater understanding of how we can provide sustainable development in coastal communities by learning more about our shallow marine environment. We also hope to collect data to evaluate the issue of attraction versus colonization though our biologic and ecologic monitoring.

This vessel and the location were chosen for this project because they provide the best opportunity to achieve these objectives when considering the alternatives. A large former naval vessel was selected as opposed to other artificial reef materials (e.g. rocks, concrete, smaller vessels, etc.) because it will by its size, appearance and notoriety create an attraction that is likely to divert users from the natural reefs and attract research and educational programs. The large vessel further provides a complex substrate that will exist throughout a large portion of the water column as opposed to other substrate materials. This high profile and complex substrate provides a better environment for reef development, thereby producing a more dynamic and diverse reef. A more diverse reef ecosystem will further attract

the users and thereby support the goals of this project. This location was selected after review of many alternatives. There simply aren't any locations outside the FKNMS that are a practical distance to visit economically. A location that is easily accessible to charter and private boats therefore is more attractive to users and supports the project goals as well. This location was selected and fine tuned due to the lack of significant marine life, lack of significant current, general bottom composition, distance from the Key West Main Ship Channel, and the lack of any submerged cultural resources. This site was selected with the help of the staff of the FKNMS and after consultation with the Key West Propeller Club, local historians and the local charter industry.

The timeline for this project is to place the vessel within 12 months of securing all funding for the project. We anticipate the sinking could happen as soon as December 2004 depending on the receipt of full funding, permits and approvals. Specifically there would be approximately 30 to 90 days of planning, followed by 180 to 270 days of vessel preparation, and about 45 days of vessel transportation and placement. We hope to have all funding in place by the middle of 2004.

The roles of the various entities have evolved slightly during the course of this project. The following roles will be in place throughout the rest of this project.

City of Key West (City) - The City is the permit holder and will hold title to the vessel. The City has contracted with Artificial Reefs of the Keys to raise the necessary funds and place the vessel in the selected location as an artificial reef. The City of Key West will be responsible for the vessel during and after its placement as an artificial reef.

Artificial Reefs of the Keys, Inc. (ARK) – ARK is a non-profit company formed to secure and place a large former naval vessel as an artificial reef in the waters off the coast of Key West. ARK has a contract with the City to raise funds and perform the work required to place the Vandenberg as outlined in the proposed project. ARK has contracted with REEFMAKERS to assist with fund raising and to be the entity that will permit, engineer, manage, prepare, and place the Vandenberg in the designated location.

REEFMAKERS, Inc. – REEFMAKERS is a for profit company that we formed to assist coastal communities procure, permit and place large vessels as artificial reefs. REEFMAKERS is under contract with ARK as described above. REEFMAKERS will be the primary entity to interface with FKNMS for the duration of the project with obvious involvement from ARK and the City, but it is REEFMAKERS job to execute the project for ARK and the City. REEFMAKERS was born out of Resource Control Corporation's (RCC) involvement with the Vandenberg Project. Jeff Dey is the President and CEO of REEFMAKERS as well as RCC and they are thus affiliated companies. REEFMAKERS was created because RCC's mission does not directly involve this type of project work. Joe Weatherby is now a Principal of REEFMAKERS and has resigned from the Board of ARK. This change was made to provide Joe with more resources to assist ARK and the City of Key West to complete this project. The point person at ARK is Chris Norwood. The Board of ARK supports

Chris with operational guidance for ARK. Joe will continue to be the main point of contact on the Vandenberg Project. REEFMAKERS has assembled the world's experts in placement of large vessels as artificial reefs details of their qualifications are presented in item 7 below.

Resource Control Corporation (RCC) – RCC is operating to focus on its mission of solving environmental problems that impact the quality of water. Several members of RCC's staff may still be involved in the project under a subcontract arrangement with REEFMAKERS.

Item 2: Life of the Project – Relative to the work of permitting, funding and placing the ship on the bottom the life of the project ends when the ship hits the bottom. This will end the work and responsibility required by contract of ARK and Reefmakers/RCC for the placement of the reef (with the exception of some ongoing monitoring activities, which are proposed in the enclosed monitoring plan). After the ship is deployed the second "life" of the project will begin. This is the point at which the transformation of the ship, brought on by the colonization of the ship by vast array marine organisms, begins. We estimate 50-100 years for this life of the project because similarly made ship reefs sunk during WWI and WWII are still regularly being enjoyed by recreational users around the world. At this point (post deployment) the permit holder would take no specific actions other than to continue to enjoy the benefits that the reef will provide. The proposed schedule for the monitoring of the reef is proposed in Item 5 of this letter as follows.

Item 3: Continuing Liability – As stated, the City of Key West will be responsible for the vessel/reef once it has been placed on the bottom. ARK and REEFMAKERS will assist the City with the ongoing monitoring required to satisfy permit conditions and this will be the ongoing mission of ARK to monitor and perhaps study the development of the reef. Regarding the concern with movement of the vessel from storms, we believe the engineering studies done and submitted with the ACOE and FDEP permit applications show that a 34 foot high waves would need to hit the vessel broadside for 9 hours for any movement to be even a possibility. Couple this with the fact that as the reef grows on the vessel it will become heavier and therefore more stable. We believe the stability demonstrated by the Vandenberg during this engineering evaluation makes it far more stable than even portions of the natural reef. Beyond these conclusions, the damage from 34-foot high waves at this location would cause catastrophic damage to the natural resources of this area, the Keys themselves, and all the structures on Key West and Stock Island.

From a surety and insurance standpoint, we do not believe that it is possible to secure either a bond or insurance for potential movement of the vessel. If such a product has been required or secured for the other ship reef projects completed in recent history within the sanctuary please provide us with information so that we can investigate this further. That being said, in the unlikely event of vessel movement requiring some action on behalf of the permit holder it is our understanding that the City of Key West would work with FKNMS and take appropriate action.

Item 4: Budget/funding – A complete project budget is provided as Attachment 1 to this letter. This budget includes funds for monitoring required in the existing ACOE and FDEP permit #44-0170771 and the monitoring anticipated to be required by the FKNMS, as described in Item 5 as follows. The FKNMS requirements are based on the Policy Statement of the National Marine Sanctuary Program: Artificial Reef Permitting Guidelines. The monitoring budget line items were excluded from the most recent project budget submitted to the FWC as part of the Vessel Transfer Agreement Application submitted to MARAD. This was done at MARAD's request.

Item 5: Monitoring – A more detailed draft-monitoring plan is submitted as Attachment 2 to this letter. The duration of this monitoring is proposed to be for a sufficient period of time to demonstrate that the project objectives have been achieved and the artificial reef's effects on the ecosystem have been documented. The structural and biological monitoring is proposed for a period of ten (10) years after the placement of the Vandenberg as described in this application. The socioeconomic and effectiveness monitoring will be conducted for the period as designed in the approved grants issued by the FWC and the NOAA. REEFMAKERS, on behalf of ARK and the City of Key West, believes that completion of this plan will satisfy the requirements in the existing ACOE and FDEP permit #44-0170771 and the monitoring requirements of the FKNMS. Some details of the monitoring requirements in the General and Special conditions of the ACOE and FDEP permits will be integrated into the final version of the monitoring plan upon issuance of a permit by the FKNMS. The FKNMS requirements are based on the Policy Statement of the National Marine Sanctuary Program: Artificial Reef Permitting Guidelines.

Item 6: Towing and sinking plan – An outline of a vessel towing and sinking plans is presented at Attachment 3 to this letter. The vessel towing and sinking plans will be finalized upon completion of the engineering study being conducted by Stevens Institute, approval of a towing plan prepared by a Marine Surveyor and approved by the US Coast Guard, and detailed vessel survey by towing contractor, ship preparation contractor, and REEFMAKERS. The final plans will be approved by all Local, State, and Federal authorities with jurisdiction over such matters, including FKNMS.

Item 7: Professional Qualifications – REEFMAKERS has assembled a highly qualified team to professionally prepare and sink large vessels as artificial reefs. The team is briefly described as follows. Resumes or bios for the team members are included as Attachment 4 to this letter. A summary of the skills offered by the team members is as follows.

Business and Project Management:

REEFMAKERS – Jeffrey C. Dey, Joe Weatherby, and Charles H. Dey

Ocean Engineering:

Stevens Institute - Dr. Michael Bruno

Ship Sinking Technical Team:

Canadian Artificial Reef Consultants - Jay Straith, Wes Roots, and Roy Gabriel

Vessel Preparation:

Various potential shipyard contractors presented in MARAD Vessel Transfer Application. REEFMAKERS plans to work with experienced and professional shipyard facilities that are familiar with Navy and MARAD ships.

Marine Sciences:

Stevens Institute – Dr. Michael Bruno
REEF – Lad Atkins

Item 8: Joint Permit Application – Enclosed is a copy of a letter to the FWC indicating the change in the language you requested to make the application accurate with respect to FKNMS regulations and policy (Attachment 5).

Item 9: NEPA – A draft Environmental Assessment is included as Attachment 6 to this letter. As provided by the FKNMS, REEFMAKERS has used the Spiegel Grove EA as a guide for this draft Vandenberg EA. Accordingly, some of the information is the same and the FKNMS will need to review this information carefully during their evaluation. Further, REEFMAKERS has left some of the previous conclusions reached by the FKNMS for reference. This is in no way intended by REEFMAKERS to suggest or make these conclusions for FKNMS.

REEFMAKERS believes that this letter and attachments should represent a complete application to the FKNMS on behalf of the City of Key West. Please contact me if you have any questions or require any additional information to assist FKNMS in your permit evaluation process.

Sincerely,
REEFMAKERS

Jeffrey C. Dey
President and CEO

Cc: Project file 134
J. Halas, J. Armor (NOAA - FKNMS)
J. Weatherby (REEFMAKERS)
C. Norwood (ARK)
R. Archer (City of Key West)
B. Horn (FWC)

Artificial Reef of the Keys, Inc.
Vandenberg Project Budget

ARK's Reef Permit Monitoring:	
Bilogical Monitoring	$78,000
Socioeconomic Monitoring	$139,400
Stuctural Monitoring	$80,000
Subtotal ARK Permit Monitoring:	**$297,400.00**

ARK's Engineering, Preparation and Reef Placement	
Site selection and testing	$45,000
Vessel inspection, selection, engineering	$55,000
Engineering and permitting	$155,000
Environmental Studies for permitting	$100,000
Transportation	$200,000
Vessel Preparation	$1,200,000
Management and Oversight during preparation	$135,000
Insurance, bonding and legal expenses	$200,000
Contingency	$300,000
Subtotal Vendors and Fees	**$2,390,000.00**

Total ARK Project Budget	**$2,687,400.00**

Amounts Anticipated from Various Sources		**Raised or Pledged to date**
MARAD GRANT	$1,250,000	$0
MC TDC	$250,000	$250,000
FWCC Grant (construction)	$10,000	$10,000
Economic Development Source	$276,000	$0
Philanthropic Donations	$650,000	$47,340
Recycling from Ship	$125,000	$0
NOAA Grant	$64,400	$64,400
FWCC Grant (monitoring)	$75,000	$75,000
	$2,700,400.00	**$446,739.84**

Biological and Ecological Monitoring Plan

Summary

The Vandenberg Project has arranged with the Reef Environmental Education Foundation (REEF) to conduct pre-deployment and periodic monitoring of the Hoyt Vandenberg and adjacent natural and artificial reef sites. Monitoring will document fish presence/absence and relative abundance at 8 sites during 7 monitoring schemes in year one and then annually thereafter. Summary reports will be provided following year one data analysis and every five years thereafter. This document outlines the Vandenberg Project monitoring plan to be carried out by REEF.

Background

The Hoyt Vandenberg is a 520' LSD to be placed as an artificial reef structure in the waters of the Florida Keys National Marine Sanctuary. When submerged, the vessel will be the largest ship ever intentionally scuttled to create an artificial reef. The site is located at position 24 27.6' / 81 44.25' and lies offshore of the main reef tract south of Marker 32 in Key West. The site is pending final approval from the National Marine Sanctuary Program. Pursuant to this approval, a plan for pre-deployment and periodic monitoring must be in place.

The Reef Environmental Education Foundation (REEF), is a 501 c (3) non-profit organization focusing on the collection of fish diversity and abundance data by utilizing volunteer divers trained in visual identification of local species. REEF's programs are in place throughout the Tropical Western Atlantic, Coastal North America, the Gulf of California, and Hawaiian waters. REEF's database containing over 66,000 individual fish surveys is the largest database of fish sightings in the world. REEF maintains numerous contracts with State of Florida, National Park Service, National Marine Sanctuary and Coastal Zone Management agencies to monitor fish populations in Sanctuaries, Parks, artificial reefs and other sites of interest to management and scientific concerns. Data collected during these contracts are entered into REEF's on-line database and summary reports are made available to the general public as well as researchers, scientists and managers.

Purpose

It is anticipated that with the sinking of the Hoyt Vandenberg, a change in fish community structure on the sinking site will take place. This monitoring plan will document the changes in fish presence/absence and abundance over time at the site. In addition, 7 nearby sites will be sampled to determine any corresponding

changes to fish populations on those sites. Additional studies being undertaken to document user patterns can be combined with this data to help show what effect, if any, the newly placed structure may have on fish community structure.

Methods

Roving Diver Technique (RDT). The RDT is a non-point visual survey method specifically designed to generate a comprehensive species list along with frequency and abundance estimates. During RDT surveys, divers swim freely throughout a dive site and record every observed fish species. At the conclusion of each survey, divers assign each recorded species one of four $\log_{10}$ abundance categories [single (1); few (2-10), many (11-100), and abundant (>100)]. Following the dive, each surveyor records the species data along with survey time, depth, temperature, and other environmental information on a REEF scansheet. The scansheets are returned to REEF, and the data are loaded into the REEF database that is publicly-accessible on the Internet at http://www.reef.org.

Once entered into the REEF database, data are displayed by geographic location, including a complete species list, Sighting Frequency of each species and Density index of abundance for each species.

(%SF = number of surveys reporting species / total number of surveys at that site Density score = $[(n_S x1)+(n_F x2)+(n_M x3)+(n_A x4)] / (n_S + n_F + n_M + n_A)$, where n is the number of times each abundance category was assigned)

Data summary reports can also be generated for side by side site comparison and summary by species.

Sampling scheme

The survey team will be made up of REEF Advanced Assessment Team members who have all achieved a level 4 or 5 experience level and have considerable experience and expertise in surveying local fish populations. Eight sites (see table 1) representing the Hoyt Vandenberg sinking site, 6 adjacent natural reefs and 1 artificial reef will be surveyed prior to deployment. Following deployment, the Vandenberg artificial reef and the remaining 7 sites will be surveyed monthly for the first three months, quarterly for the following three quarters and yearly thereafter. This scheme represents a total of 7 monitoring sessions in year 1.

Table 1. Monitoring sites

Western Sambos Deep (60-100')	
Western Sambos Shallow (20’)	24 28.75:-81 42.98
Joe’s Tug	24 27.83:-81 44.24
Marker 32 Shallows (30’)	24 28.43:-81 44.65
Marker 32 Deep (60-100')	
Eastern Dry Rocks Shallow (30')	24.27.50:-81.50.44
Eastern Dry Rocks Deep (60-100')	
Hoyt Vandenberg Site (40-100’)	24 27.6' / 81 44.25'

Site descriptions

The 8 sites to be surveyed represent a broad range of nearby natural and artificial structure. The Hoyt Vandenberg site is represented by barren, level sand bottom with a depth of approximately 130’. The closest structure to this site is a small patch of rocky substrate located approximately 2/10ths of a mile from the proposed sinking location in a depth of approximately 125’. The nearest substantial reef structures are the natural reef edges near Marker 32 and Western Sambos approximately 4/10ths of a mile shoreward (North) and 2 miles northeast, respectively, of the sinking site. These reefs are sloping drop-offs are represented by low profile hardbottom with sparse coverings of small corals and sponges. Approximately 8/10ths of a mile inshore from the sinking site, lies Marker 32 Shallows and 2 miles northeast lies Western Sambos Shallows, both hardbottom areas of moderate rugosity represented by moderate to high profile structure and moderate coral cover. These sites represent the nearest shallow water coral reef communities to the sinking site. More than 5 miles to the west lies another steeply sloping drop-off at Eastern Dry Rocks Deep as well as the corresponding shallow high relief Eastern Dry Rocks Shallow. Barely ¼ of a mile from the sinking site lies the artificial reef known as Joe’s Tug. This site represents the closest artificial reef and harbors a large diversity and abundance of fish. Additional historical baseline data collected as part of the REEF program (more than 650 surveys) are available for the surrounding high profile reefs including Rock Key, Sand Key, Middle and Eastern Sambos, and 9 Foot Stake.

Reporting

Following year 1 monitoring, a summary report will be produced outlining temporal changes in species composition and populations on the Vandenberg site. In addition, analysis of the 7 reference sites will be conducted to document any change in composition or abundance at those locations. Summary data reports will be generated from the REEF database (see fig 1) as well as site similarity comparisons (fig 2).

Figure 1. Geographic report showing fish sighting frequency and density measures from Benwood wreck available on REEF website

REEF HOME \ ABOUT REEF || DATA || MEMBER SERVICES || WEB RESOURCES || SEARCH

Geographic Report

Region TWA

Geographic Zone 34030011
(Benwood Wreck)

Date Range ALL

Click on any region or code in the left column to view only those data

Survey Type: SA = Species & Abundance; SO = Species Only help

		Surveys				Bottom Time
Subset Data		Expert		Novice		
Code	Site	SA	SO	SA	SO	(H:M)
34030011	Benwood Wreck	50	1	126	1	167:47
TOTALS		50	1	126	1	167:47

%SF = Sighting Frequency; DEN = Density Score help

Click headers to sort and ↵ to switch between common and scientific names.

		Total		Expert		Novice	
Rank	Common Name ↵	SF%	DEN	SF%	DEN	SF%	DEN
1	Blue Tang	93.7%	2.7	100%	2.8	91.2%	2.6
2	Sergeant Major	91.4%	3.4	98%	3.5	88.8%	3.4

3	Bicolor Damselfish	91.4%	3.1	100%	3.3	88%	3
4	Porkfish	90.3%	2.7	98%	2.7	87.3%	2.7
5	Foureye Butterflyfish	89.7%	2.1	98%	2.1	86.5%	2.1
6	Yellowtail Snapper	88.6%	3.3	96%	3.3	85.7%	3.3
7	Bluestriped Grunt	88.6%	3	98%	2.9	84.9%	3.1
8	Schoolmaster	88%	3.1	98%	3.2	84.1%	3.1
9	Stoplight Parrotfish	87.5%	2.4	92%	2.6	85.7%	2.3
10	Great Barracuda	86.9%	2.1	92%	2.1	84.9%	2
11	Trumpetfish	86.9%	1.8	94%	1.9	84.1%	1.8
12	Bluehead	86.3%	2.9	100%	3.2	80.9%	2.7
13	Ocean Surgeonfish	85.7%	2.7	94%	2.8	82.5%	2.6
14	French Grunt	83.5%	3	98%	3	77.7%	3
15	Yellow Goatfish	81.2%	3.3	98%	3.6	74.6%	3.1
16	Yellowtail Damselfish	81.2%	2.3	96%	2.2	75.3%	2.3
17	Blue Chromis	78.9%	2.7	88%	2.7	75.3%	2.7
18	Sharpnose Puffer	78.4%	2.2	100%	2.4	69.8%	2.1
19	Spanish Hogfish	78.4%	1.9	100%	2.1	69.8%	1.8
20	Brown Chromis	77.2%	3.1	98%	3.3	69%	3
21	Bar Jack	77.2%	2.6	88%	2.7	73%	2.5
22	Spanish Grunt	76.7%	2.2	94%	2.2	69.8%	2.2
23	Bermuda Chub/Yellow Chub	76.1%	2.4	94%	2.4	69%	2.4
24	Queen Parrotfish	75.5%	2.2	96%	2.3	67.4%	2.1
25	Yellowhead Wrasse	75%	2.6	100%	2.8	65%	2.5
26	Mahogany Snapper	75%	2.6	94%	2.6	67.4%	2.6
27	Spotfin Butterflyfish	70.4%	2	82%	1.9	65.8%	2
28	Tomtate	69.8%	3.4	92%	3.8	61.1%	3.3
29	Doctorfish	67.6%	2	82%	2.1	61.9%	2
30	Black Grouper	67.6%	1.6	82%	1.8	61.9%	1.6
31	Princess Parrotfish	67%	2.2	90%	2.2	57.9%	2.1
32	Longspine Squirrelfish	66.4%	2.1	86%	2.4	58.7%	2
33	Rock Beauty	66.4%	1.8	80%	1.8	61.1%	1.8
34	Gray Angelfish	66.4%	1.5	72%	1.5	64.2%	1.6
35	Lane Snapper	65.9%	3.1	84%	3.3	58.7%	3.1
36	Graysby	65.9%	1.7	90%	1.9	56.3%	1.6
37	Hogfish	65.9%	1.6	78%	1.6	61.1%	1.6
38	Redband Parrotfish	65.3%	2.4	94%	2.6	53.9%	2.3
39	White Grunt	65.3%	2.4	84%	2.4	57.9%	2.4
40	Butter Hamlet	64.7%	2	90%	2	54.7%	2
41	Blue Parrotfish	63%	1.7	68%	1.7	61.1%	1.7
42	Smooth Trunkfish	63%	1.6	78%	1.7	57.1%	1.5

43	Harlequin Bass	60.2%	2	78%	2.1	53.1%	1.9
44	Creole Wrasse	59.6%	2.8	88%	2.8	48.4%	2.7
45	Spotted Goatfish	59%	2	90%	2	46.8%	2
46	Queen Angelfish	58.5%	1.4	72%	1.3	53.1%	1.4
47	Striped Parrotfish	57.9%	2.5	96%	2.6	42.8%	2.5
48	French Angelfish	57.9%	1.5	64%	1.4	55.5%	1.6
49	Threespot Damselfish	57.3%	2.2	84%	2.2	46.8%	2.1
50	Smallmouth Grunt	56.2%	3.1	86%	3.2	44.4%	3
51	Glasseye Snapper	56.2%	1.9	84%	2.1	45.2%	1.7
52	Black Margate	55.6%	1.9	74%	2	48.4%	1.8
53	Reef Butterflyfish	55.6%	1.7	86%	1.7	43.6%	1.8
54	Glassy Sweeper	55.1%	3	74%	3	47.6%	3
55	Scrawled Filefish	54.5%	1.3	66%	1.3	50%	1.4
56	Clown Wrasse	53.4%	2.3	88%	2.2	39.6%	2.4
57	Masked Goby/Glass Goby	51.7%	2.7	88%	2.7	37.3%	2.7
58	Bridled Goby	47.7%	2.2	78%	2.3	35.7%	2.1
59	Caesar Grunt	47.1%	2.3	78%	2.2	34.9%	2.3
60	Squirrelfish	47.1%	2.1	52%	2	45.2%	2.2
61	Cocoa Damselfish	44.8%	1.9	76%	2.1	32.5%	1.7
62	Slippery Dick	44.3%	2.4	74%	2.3	32.5%	2.5
63	Goldspot Goby	42.6%	2.3	78%	2.5	28.5%	2.1
64	Midnight Parrotfish	41.4%	1.8	54%	1.7	36.5%	1.9
65	Blue Hamlet	40.9%	1.5	56%	1.6	34.9%	1.4
66	Yellowhead Jawfish	39.7%	2	66%	2.2	29.3%	1.9
67	Puddingwife	38%	2	64%	2	27.7%	1.9
68	Neon Goby	37.5%	2.1	78%	2.1	21.4%	2
69	Atlantic Spadefish	36.9%	2	48%	2	32.5%	2.1
70	Gray Snapper	34%	2.3	50%	2.3	27.7%	2.3
71	Nassau Grouper	31.8%	1.2	28%	1.3	33.3%	1.2
72	Blue Goby	31.2%	1.9	62%	1.9	19%	1.9
73	Beaugregory	30.1%	1.9	48%	2	23%	1.8
74	Colon Goby	28.4%	1.8	56%	1.9	17.4%	1.7
75	Sand Tilefish	26.7%	1.7	48%	1.8	18.2%	1.6
76	Rainbow Parrotfish	26.1%	1.8	20%	1.4	28.5%	2
77	Barred Hamlet	25.5%	1.3	34%	1.2	22.2%	1.3
78	Dog Snapper	25%	1.5	46%	1.6	16.6%	1.4
79	Spotted Drum	25%	1.2	38%	1.2	19.8%	1.2
80	Spotted Trunkfish	23.8%	1.3	22%	1.2	24.6%	1.3
81	Tobaccofish	23.2%	1.7	48%	1.6	13.4%	1.7
82	Redtail Parrotfish	19.8%	1.8	38%	1.7	12.6%	1.8

83	Yellow Stingray	19.8%	1.3	24%	1.3	18.2%	1.3
84	Banded Butterflyfish	19.3%	1.8	12%	1.6	22.2%	1.9
85	Sailors Choice	17.6%	2.2	24%	2.1	15%	2.2
86	Yellowtail (Redfin) Parrotfish	17.6%	1.9	20%	2	16.6%	1.9
87	Highhat	17.6%	1.4	36%	1.6	10.3%	1.3
88	Permit	16.4%	1.2	16%	1.1	16.6%	1.3
89	Green Moray	15.3%	1	18%	1.1	14.2%	1
90	Greenblotch Parrotfish	14.2%	1.9	32%	2	7.1%	1.7
91	Dusky Damselfish	13.6%	2.1	6%	1.6	16.6%	2.1
92	Hovering Goby	13.6%	1.9	32%	2.1	6.3%	1.5
93	Mutton Snapper	13.6%	1.7	12%	1.5	14.2%	1.7
94	Coney	13.6%	1.3	14%	1	13.4%	1.5
95	Blue Angelfish	13.6%	1.2	14%	1.1	13.4%	1.2
96	Scrawled Cowfish	13%	1.1	22%	1.1	9.5%	1.1
97	Sand Diver	13%	1	18%	1.1	11.1%	1
98	Indigo Hamlet	12.5%	1	12%	1	12.6%	1
99	Pallid Goby	11.9%	1.8	26%	1.8	6.3%	1.7
100	Common Snook	11.9%	1.3	10%	1.2	12.6%	1.4
101	Yellowmouth Grouper	11.3%	1.3	24%	1.2	6.3%	1.3
102	Spotted Scorpionfish	11.3%	1.2	18%	1.1	8.7%	1.2
103	Black Hamlet	11.3%	1.2	20%	1.1	7.9%	1.3
104	Whitespotted Filefish	10.2%	1.4	16%	1.5	7.9%	1.4
105	Green Razorfish	9.6%	2	12%	2.5	8.7%	1.7
106	Porcupinefish	9.6%	1.4	14%	1.2	7.9%	1.5
107	Redlip Blenny	9.6%	1.3	20%	1.4	5.5%	1.2
108	Ocean Triggerfish	9%	1.1	6%	1	10.3%	1.1
109	Wrasse Blenny	8.5%	1.6	28%	1.7	0.7%	1
110	Lantern Bass	8.5%	1.2	12%	1.3	7.1%	1.1
111	Peppermint Basslet	8.5%	1.1	18%	1.1	4.7%	1.1
112	Lancer Dragonet	7.9%	1.2	14%	1.1	5.5%	1.2
113	Longfin Damselfish	7.3%	2	10%	2.4	6.3%	1.7
114	Purple Reeffish	7.3%	2	12%	2.1	5.5%	1.8
115	White Margate	7.3%	1.5	10%	1.2	6.3%	1.7
116	Sharksucker	7.3%	1.1	8%	1	7.1%	1.2
117	Southern Stingray	7.3%	1.1	12%	1.1	5.5%	1.1
118	Cero	6.8%	1.2	12%	1.1	4.7%	1.3
119	Silversides, Herrings, Anchovies	5.6%	3.1	14%	2.7	2.3%	4
120	Bigeye	5.6%	1.6	2%	2	7.1%	1.5
121	Cottonwick	5.6%	1.4	8%	1.5	4.7%	1.3
122	Nurse Shark	5.6%	1.1	6%	1.3	5.5%	1

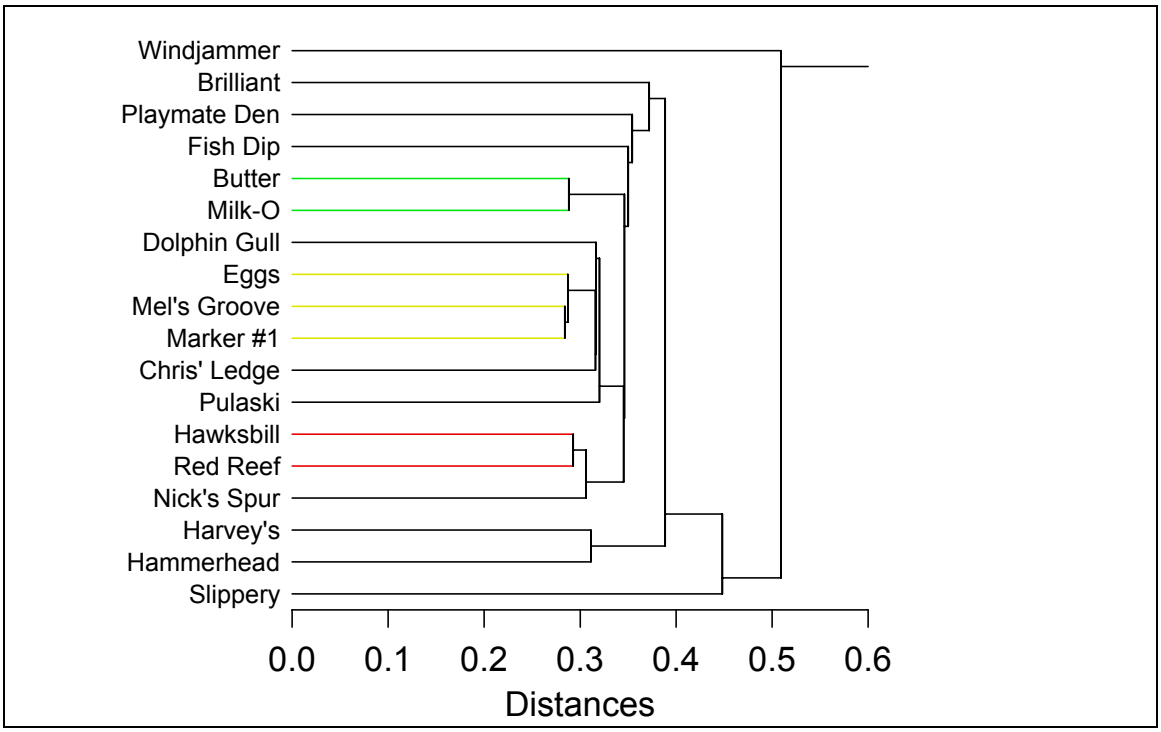
123	Orangespotted Filefish	5.1%	1.6	10%	1.4	3.1%	2
124	Red Hind	5.1%	1.3	2%	1	6.3%	1.3
125	Slender Filefish	5.1%	1.3	10%	1.2	3.1%	1.5
126	Seaweed Blenny	5.1%	1.3	14%	1.2	1.5%	1.5
127	Honeycomb Cowfish	5.1%	1.2			7.1%	1.2
128	Redspotted Hawkfish	5.1%	1.1	6%	1	4.7%	1.1
129	Roughhead Blenny	4.5%	1.3	10%	1.6	2.3%	1
130	Yellow Jack	4.5%	1.3	8%	1	3.1%	1.7
131	Saddled Blenny	4.5%	1.3	8%	1.5	3.1%	1.2
132	Saucereye Porgy	4.5%	1.1	8%	1.2	3.1%	1
133	Bluelip Parrotfish	3.9%	1.8	12%	1.8	0.7%	2
134	Longjaw Squirrelfish	3.9%	1.7	4%	1.5	3.9%	1.8
135	Belted Cardinalfish	3.9%	1.4	4%	1.5	3.9%	1.4
136	Cubera Snapper	3.9%	1.2	8%	1.5	2.3%	1
137	Spotted Moray	3.9%	1	4%	1	3.9%	1
138	Striped Grunt	3.4%	2.3	4%	2	3.1%	2.5
139	Reef Squirrelfish	3.4%	1.8	2%	1	3.9%	2
140	Flamefish	3.4%	1.6	8%	1.5	1.5%	2
141	Balloonfish	3.4%	1.3	2%	1	3.9%	1.4
142	Chalk Bass	3.4%	1.1	4%	1	3.1%	1.2
143	Bandtail Puffer	3.4%	1.1	-- SO --		4.7%	1.1
144	Tan Hamlet	3.4%	1	10%	1	0.7%	1
145	Goldentail Moray	3.4%	1	6%	1	2.3%	1
146	Bucktooth Parrotfish	2.8%	2.4	8%	2.5	0.7%	2
147	Rock Hind	2.8%	1.6			3.9%	1.6
148	Blackbar Soldierfish	2.8%	1.4			3.9%	1.4
149	Tiger Grouper	2.8%	1.2			3.9%	1.2
150	Crevalle Jack	2.2%	2.7	4%	2.5	1.5%	3
151	Yellowfin Mojarra	2.2%	2			3.1%	2
152	Rosy Razorfish	2.2%	2			3.1%	2
153	Black Durgon	2.2%	1.5	4%	1	1.5%	2
154	Yellowfin Grouper	2.2%	1.2	2%	1	2.3%	1.3
155	Sailfin Blenny	2.2%	1.2			3.1%	1.2
156	Red Grouper	2.2%	1	6%	1	0.7%	1
157	Blackear Wrasse	1.7%	3			2.3%	3
158	Boga	1.7%	2.6	4%	2	0.7%	4
159	Barred Cardinalfish	1.7%	2.3	2%	2	1.5%	2.5
160	Banded Jawfish	1.7%	1.6			2.3%	1.6
161	Tarpon	1.7%	1.6	2%	1	1.5%	2
162	Dusky Squirrelfish	1.7%	1.6	4%	2	0.7%	1

163	Scamp	1.7%	1.6			2.3%	1.6
164	Sunshinefish	1.7%	1.6	2%	1	1.5%	2
165	Reef Croaker	1.7%	1.3	4%	1.5	0.7%	1
166	Jackknife-Fish	1.7%	1.3	6%	1.3		
167	Night Sergeant	1.1%	2.5			1.5%	2.5
168	Horse-Eye Jack	1.1%	2.5	2%	2	0.7%	3
169	Peppermint Goby	1.1%	2.5			1.5%	2.5
170	Fairy Basslet	1.1%	2			1.5%	2
171	Secretary Blenny	1.1%	1.5	2%	2	0.7%	1
172	Darkheaded Blenny	1.1%	1.5	2%	2	0.7%	1
173	Queen Triggerfish	1.1%	1.5	2%	1	0.7%	2
174	Greater Soapfish	1.1%	1	2%	1	0.7%	1
175	Blackfin Snapper	1.1%	1	4%	1		
176	Goliath Grouper (Jewfish)	1.1%	1	2%	1	0.7%	1
177	Eyed Flounder	1.1%	1	4%	1		
178	Pale Cardinalfish	0.5%	3			0.7%	3
179	Sheepshead	0.5%	3			0.7%	3
180	Dusky Cardinalfish	0.5%	3			0.7%	3
181	Whitespotted Soapfish	0.5%	2			0.7%	2
182	Almaco Jack	0.5%	2			0.7%	2
183	Spinyhead Blenny	0.5%	2	2%	2		
184	Rainbow Wrasse	0.5%	2			0.7%	2
185	Creole-fish	0.5%	2			0.7%	2
186	Whitestar Cardinalfish	0.5%	2			0.7%	2
187	Manta	0.5%	1			0.7%	1
188	Knobbed Porgy	0.5%	1	2%	1		
189	Spotted Goby	0.5%	1	2%	1		
190	Dash Goby	0.5%	1			0.7%	1
191	Roughhead Triplefin	0.5%	1	2%	1		
192	Polka-dot Batfish	0.5%	1	2%	1		
193	Gray Triggerfish	0.5%	1			0.7%	1
194	Reef Scorpionfish	0.5%	1	2%	1		
195	Spotted Eagle Ray	0.5%	1	2%	1		
196	Spanish Mackerel	0.5%	1			0.7%	1
197	Greater Amberjack	0.5%	1			0.7%	1
198	Blue Runner	0.5%	1			0.7%	1
199	Hybrid Hamlet	0.5%	1	2%	1		
200	Masked Hamlet	0.5%	1	2%	1		

201	Cubbyu	0.5%	1	2%	1		
202	Yellowtail Reeffish	0.5%	1	2%	1		
203	Southern Sennet	0.5%	1			0.7%	1

Contact REEF

Figure 2. Sample dendogram showing site similarity using REEF data from Tortugas National Park.



Draft Structural Monitoring Plan

REEFMAKERS will place self-recording motion detectors on the vessel, e.g., a collection of accelerometers, inclinometers and pressure sensors. By comparing the observed motions, if any, with the incident wave characteristics from a NOAA buoy or the pressure sensors, we can assemble a cause-and-effect record of vessel response during storms. This data will be reviewed on a regular basis and reports of findings will be prepared and submitted on an annual basis.

Statement of Work
For
Artificial Reefs of the Keys, Inc.
In support of the Socioeconomic Monitoring Program for the
Florida Keys National Marine Sanctuary

Background

Artificial Reefs of the Keys, Inc. (ARK) has proposed to sink a 510 foot decommissioned naval vessel six miles offshore of Key West Florida in the Florida Keys National Marine Sanctuary (FKNMS) to serve as an artificial reef. ARK has received permit authority from all the necessary agencies to sink the U.S.S. Hoyt S. Vandenberg.

As a condition of the FKNMS permit to sink the Vandenberg as an artificial reef, ARK has agreed to help develop and implement a monitoring of the use of the new artificial reef and surrounding artificial and natural reefs. The monitoring of use would have to be designed to test the hypothesis that the introduction of an artificial reef would reduce pressure (i.e., use) on the surrounding natural reefs in the FKNMS.

Dr. Vernon R. (Bob) Leeworthy of NOAA's, National Ocean Service, Special Projects is in charge of running the Socioeconomic Monitoring Program for the FKNMS. In 1998, Dr. Leeworthy hired Dr. Ray Souter to review data collected by the Florida Marine Research Institute (FMRI) designed to estimate usage of small discrete areas. The method was evaluated for its potential use for estimating use of Sanctuary Preservation Areas (SPAs) and Ecological Reserves (ERs) as well as artificial reefs. Dr. Souter concluded that the FMRI methodology would have to be modified and could be accomplished by expanding the on-site surface surveys to 72 days per year per site (4 weekdays and 2 weekend days per month per site). However, this method has proven too expensive to implement.

In 1999, Dr. Leeworthy designed an alternative method that would require that all charter (for hire) operations provide information from their dive logs. Dive logs included information of specific site dived, time of arrival and departure, number of divers, use of mooring buoys and weather. A revised methodology was developed that used surface surveying to estimate the ratio of private household and rental boat usage to charter boat usage. This ratio would be used to extrapolate from charter boat usage gathered from dive logs to total usage. To estimate this ratio reliably would require significantly less on-site surface survey time and thus become affordable to implement.

In May 2001, ARK applied for a grant from the Florida Fish and Wildlife Conservation Commission, Division of Marine Fisheries, Bureau of Marine Fisheries Management, Artificial Reef Program (FFWCC) to monitor usage pre and post sinking of the U.S.S. Hoyt S. Vandenberg. The proposal was designed to meet the

requirements of the FKNMS to test whether the introduction of the artificial reef in the Key West region of the FKNMS would take pressure off (reduce usage of) the natural reefs surrounding the new artificial reef.

Dr. Leeworthy was asked to review the proposal by FFWCC. Dr. Leeworthy concluded the proposed design would not meet the objectives. Dr. Leeworthy offered an alternative design that would work, but it would require doubling the surface survey component. ARK subsequently agreed to alter their proposal. Dr. Leeworthy agreed to pay for the pre sinking monitoring, while the FFWCC would provide ARK with a grant to do the post sinking data collection and analysis. Pre sinking data collection would be paid for through the Socioeconomic Monitoring Program for the FKNMS.

Tasks

The contractor shall provide the following to NOAA:

1. Pre sinking usage data for the artificial reefs and natural reefs surrounding the proposed site for sinking the U.S.S. Hoyt S. Vandenberg.

2. Historical data of usage from dive logs of all the charter dive operations that use the artificial and natural reefs surrounding the proposed site for the sinking of the U.S.S. Hoyt S. Vandenberg.

Detailed Requirements

Charter/Party/For Hire Industry Log-book Data. From all for hire dive operations that utilize the artificial and natural reefs surrounding the proposed site for sinking the U.S.S. Hoyt S. Vandenberg, the date of each visit to each site (e.g. artificial and natural reef), number of snorkelers and number of scuba divers on each visit, mooring buoy or anchor use, and weather conditions on each visit. Data should be inputted into either an Excel spreadsheet of Dbase database. For transmittal to NOAA, each dive operation should be assigned a data base identification number and the name of the business eliminated to protect proprietary nature of the information.

Private Household/Rental Boat Use—On-site Survey Sampling. On-site survey sampling will be required to estimate the ratio of private household/rental boat usage to charter boat usage. On-site sampling shall include one weekday and one weekend day per month in each season and at each type of reef (artificial and natural). Sampling at each site on a given day should include a full day of sampling. Selection of sampling sites could follow either random sample site selection or the protocol offered by ARK in its proposal to FFWCC of selecting sites east to west then west to east. Sampling should be done a total of 72 days, 36 days during the summer (Aug., Sept., Oct., and Nov) and 36 days during the winter (Dec. 2001, and Jan., Feb., Mar. and April). The Table below shows the number of days stratified by type of reef and season (summer and winter).

Pre Sinking of the Vandenburg

	Days of Sampling		
Sampling Sites	Summer[1]	Winter[2]	Total
All Artificial Reefs	18	18	36
All Natural Reefs	18	18	36
Total	36	36	72

1. Summer months Aug., Sept., Oct., Nov.
2. Winter months Dec., Jan., Feb., Mar., Apr.

Information on each sampling day on each site should include date of sampling, time period of sampling, site name, type of each boat observed (charter—for hire or private household/rental boat), anchored or moored to buoy, time of arrival and time of departure. For private household/rental boats, the number of passengers aboard, the number of passengers snorkeling, and the number of passengers scuba diving shall be obtained. It is recognized that the on-site observers will not always be able to get counts of the number of passengers aboard each private household/rental boat or the number doing either snorkeling or scuba diving. By sampling a full day at each site, it is assumed that large enough samples of private household/rental boats will be obtained to yield reliable estimate of the average number of snorkelers and scuba divers per boat.

The on-site sampling data shall also be inputted into either an Excel spreadsheet or a Dbase database. As with the charter boat dive log information, the contractor shall remove any identifying information on individual boats before transferring to NOAA. Individual boat identification shall be used by the contractor only in checking on-site sampling data with charter boat dive log information.

ARTIFICIAL REEFS OF THE KEYS, INC.
ARTIFICIAL REEF MONITORING GRANT

INTRODUCTION

The purpose of this project is to collect data on fishing/diving usage patterns following the scuttling of a 520 foot decommissioned ex-military vessel, the U.S.S. Hoyt S. Vandenberg (Vandenberg), in order to determine if the creation of this very large artificial reef will reduce user pressure on adjacent natural and artificial reefs. The Florida Fish and Wildlife Conservation Commission (FWC), in cooperation with Artificial Reefs of the Keys, Inc. (ARK), The Florida Keys National Marine Sanctuary (FKNMS) and the National Atmospheric and Oceanic Administration (NOAA) wish to investigate the impact of a highly preferred type of artificial reef on the level and distribution of anthropogenic pressure on reef systems. This project is also being financially supported by NOAA, and is intended to serve as a prototype for data collection and analysis of user pressure for Special Protected Areas (SPAs) and Special Management Zones (SMZs) within the entire system of National Marine Sanctuaries.

TASKS

ARK shall be responsible for completion of the following tasks:

Task 1 - Fishing and Diving Charter Boat Use Survey

ARK will distribute and collect (on a monthly basis) a survey form to each of the thirty-four (34) fishing and diving charter operators in Key West identified in the grant application for the period 0f 18 months.

Task 2 - On-site user survey

ARK will conduct on-site user observations (one reef site per day) for a total of nine (9) months (72 sampling days) during the course of this Agreement. During each month sampling will occur on an equal number of weekday and weekend days (weather dependent). The on-site surveys will be initiated at two different time periods, depending on the actual sinking date of the Vandenberg. As another grant from the Special Projects office of NOAA/NOS will be funding the pre-deployment on-site user surveys from August 2001 through April 2002, the funds from this Agreement will be utilized during the following time frames:

If the sinking is delayed past May 2002, up to three (3) months of pre-deployment on-site user surveys will be conducted, in order to provide a full twelve (12) month sample. The surveys would then be discontinued until two (2) months post-deployment when the remaining months of on-site surveys will be completed. It is anticipated that the Special Projects Office of NOAA/NOS will assist with funding in order to complete a full twelve months of post-deployment surveys.

If the sinking occurs during May 2002, the on-site surveys under this Agreement will be initiated in August of 2002 and continue for nine (9) months through April 2003. It is anticipated that the Special Projects Office of NOAA/NOS will assist with funding in order to complete a full twelve months of post-deployment surveys.

Task 3 - Data Transfer

ARK will provide complete copies of all data collected in both this Agreement and the NOAA project in both paper and electronic (Microsoft Excel™) formats to both the Commission and to Dr. Bob Leeworthy of the NOOA/NOS Special Projects Office.

Task 4 -Data Analysis

The data from the on-site surveys will be used to estimate total private recreational use and pattern, as well as to verify the data obtained from the fishing and diving charter boat surveys.

ARK will examine all data collected and analyze such data (both statistically and graphically) to determine total use levels and patterns for pre- and post-deployment periods. The objective of the analyses will be to determine the influence of the Vandenberg on user pressure (both fishing and diving) on the natural and artificial reefs adjacent to the Vandenberg site.

Draft Towing Plan
Ex-USNS General Hoyt S. Vandenberg

Summary:
The following towing plan will be utilized during the tow of the ex-USNS General Hoyt S. Vandenberg (Vessel) from it's present location at (this will be the location of the shipyard facility selected to prepare the ship for reefing. Most likely this location will be in the Norfolk Virginia area) to it's final location 6.5 nautical miles south of Key West Florida. A towing survey will be conducted prior to embarking on the tow and a tow survey certificate will be prepared. Towing of ship from contractor's place of business to the reef site shall be accomplished in accordance with all Federal and State laws, rules, or regulations pertaining to such work. The contractor shall insure that adequate anchoring capability is aboard during the tow. Contractor shall employ at least two (2) tugs when departing ports and when approaching the reef site. At least two (2) tugs will be used at all times while the Vessel is inside of the FKNMS. It may be feasible for one tug to transport the Vessel during the majority of the tow in the open ocean. The exact number of tugs to be used during various portions of the tow will be presented to the appropriate authorities in the final towing plan. Contractor shall be responsible for obtaining all necessary Federal permits or approvals. If towing is accomplished during other than daylight hours, adequate lighting shall be maintained. Towing shall be accomplished only during suitable weather. Towing shall occur such that all areas to be avoided (ATBA) will not be included in the proposed towing route.

A meeting with FKNMS and other government agencies with jurisdiction will be held prior to the Vessel leaving port at the shipyard. This meeting will be held at the shipyard as vessel inspection can be conducted at this time. Towing routes, procedures and contingencies will be reviewed at this meeting. The sinking plan will also be reviewed at this meeting.

Draft towing gear description: Primary towing points will be identified upon vessel survey; these are generally Forward Capstan or Bollards. Primary towing gear will ideally be part of vessel's anchor chain. It will likely be 2" or larger stud link chain. Connection for this chain will be appropriately sized "high test" shackles, which will be either "double nut, triple pin or weldable".

The primary tow line will have at least 1 shot (90 feet) of chain, in addition to the bridle length. The tug(s) will fasten their towing cable to this additional shot. The bridle will be fastened to the primary towing points and fed through either large fairleads or anchor hawse pipes. It is important that the primary towing gear is adequately long, heavy and with minimal potential chafing in heavy weather.

Emergency towing gear is needed in the event of separation of the primary towing gear. In this circumstance, most probably heavy sea state exists and putting men aboard a vessel will be near impossible. Also getting close to the vessel will be difficult at best. The deployment of the emergency tow line will happen only in the

event of complete primary tow line separation. The emergency towing line will be a bridle or single point connection on the bow. The emergency towing points will be separate of the primary towing points and the chain (of similar size to the primary gear) it will not interfere with the primary towing gear. As with the primary gear the emergency towing gear will be fed through a fair lead to eliminate chaffing.

The chain (over 120 feet total length) will be fastened with appropriate size tested "double nut, triple pin or weldable shackles". The chain will then be pulled taut and lashed or tab fastened down the shear of the vessel toward the stern. (Outboard of any obstacles). Attached to the chain will be an adequately sized towing cable which will terminate no shorter than the aft most point of the vessel. Attached to the emergency towing cable (which will have eyes spliced both ends) will be a floating line approximately 3" of brightly colored synthetic material. This floating line will be of braided construction (so as not to spin like 3 strands while being towed). This floating "trailing" line will have attached to its end a large lightweight brightly colored buoy.

The following conditions must be adhered to throughout the duration of the tow:

Riding Crew: Qualified personnel to be on board to handle lines and bridle on departure from vessel cleaning facility, during transit and upon arrival at Key West, Florida.

Towing Arrangement: The tugs to be made up along side secured by hawsers to the ship's mooring equipment; the locations at the discretion of the Towing Master.

Ladder: A suitable pilot ladder to be provided for access by the line handlers and Towing Master.

Shaft Lock: Shaft lock to be installed and inspected by contractor

Rudder Lock: Rudder lock to be installed and inspected by contractor.

Shaft Alley Door: To be closed during transit.

Weather: Suitable wind and tide conditions to be in effect during the transit with winds not exceeding 20 knots.

Pilot: Tow to be under the direction of a competent, Federally licensed towing Master.

Communications: Towing and departure arrangements and time to be provided to the applicable United States Coast Guard installations along the route of the Tow.

The practice of good seamanship to be observed at all times.

Draft Sinking Plan
Ex-USNS General Hoyt S. Vandenberg

Overview:

The ship will be transported to the sinking location from Virginia with all environmental and interior preparation completed. The ship will arrive with external watertight integrity and interior integrity to the extent required by marine surveyors and to the safe arrival on site. Once on site the ship will be opened on the upper decks and in the super structure.

Shaped explosive charges with be prepared on shore and taken to the ship after arrival off Key West. The ship will have been previously ballasted through a combination of flooding of tanks to full and use of inert materials in some vessel spaces.

Upon arrival to the site the ship will be anchored in place with sufficient ground tackle to maintain the position over the designated reef location. The vessel will be anchored only from the bow. This will allow for the vessel to "weathervane" with variation in the wind direction. Experience by REEFMAKERS team has shown that stern anchoring has resulted in premature sinking and inappropriate orientation. The vessel would be moved into the appropriate location using tug(s) just prior to sinking. At least two tugs will be present at all times the vessel is being transported within the FKNMS and within 24 hours of the beginning the sinking operations. Depending on weather conditions a stern anchor may be attached just prior to sinking. This plan will be expanded upon issuance of a permit from FKNMS and consult with the appropriate authorities.

Immediately prior to sinking hull openings above the water line will be opened using "tab cutters" to complete cuts in the hull started previously. This insures that the ship maintains watertight integrity for as long as possible and is only open in favorable weather.

The main shaped charges will use "flex linear explosives". They will be detonated below the water line along various parts of the hull. Water will flood the hull evenly permitting the ship to arrive on the sea floor on its keel. This technique has been used successfully on numerous ships around the world.

A one-kilometer safety perimeter will be maintained throughout this operation. Crowd control will be planned and controlled with the input and assistance of the Coast Guard, FKNMS, and Local authorities.

Upon sinking the vessel will initially be surveyed by qualified explosives experts to assure all flex linear explosives have discharged. Upon approval of safe conditions by the explosives experts, trained divers will then inspect the vessel to assure that no loose panels; bulkheads or materials were created during the sinking process.

After the inspections indicate the vessel has been placed as designed the sinking of the vessel will be considered deployed.

Planning:

REEFMAKERS and ARK have engaged Stevens Institute to conduct pre sinking and towing studies of the Vandenberg to evaluate the proposed plans. The scope of these studies is described as follows.

REEFMAKERS will be teaming with Stevens Institute of Technology's Davidson Laboratory for engineering evaluation and testing for each vessel to be prepared and placed as an artificial reef by REEFMAKERS. Dr. Michael Bruno will be the lead from Stevens Institute to REEFMAKERS on aspects relating marine engineering and vessel transportation and preparation. The Davidson Laboratory is a Hydrodynamic and Ocean Engineering research center. The Laboratory is a division of Stevens Institute of Technology's Department of Civil, Environmental and Ocean Engineering. The Laboratory has an international reputation in marine craft development and testing, as well as advanced research in Coastal Engineering, Marine Environmental Engineering and Underwater Acoustics.

The Davidson Laboratory staff will build and test a scale model of the Vandenberg. This will provide for actual testing under various conditions of a model of the Vandenberg during towing, sinking and after placement. This pre-preparation testing will allow REEFMAKERS to test various vessel preparation designs and provide ARK and the relevant regulatory bodies with the comfort that the Vandenberg will be transported and placed as planned. The selection of the optimally prepared design will provide for efficient planning of the vessel preparation. The testing will be performed in Davidson Laboratory's oblique sea basin and their straight high speed-towing tank.

The oblique sea basin, one of only two of its kind in the nation, has a length of 75 feet, a breadth of 75 feet and can support water depths as high as 5 feet. The facility, which has been designated a historic mechanical engineering landmark, comes equipped with a moveable overhead rail, which permits vehicles to be towed in oblique waves at speeds of up to 10 feet per second. The wave maker in the basin has the ability to generate both regular and irregular waves with heights up to seven inches.

Davidson Laboratory's straight tank has a length of 313 feet and a breadth of 12 feet and can support water depths as high as 6 feet. It is one of the highest-speed towing tanks in the world, with a monorail supported, cable-driven carriage capable of speeds from 0 to 100 feet per second with speed control of .01 feet per second.

The Stevens tank can produce a wide variety of wave types through an articulated double-flap programmable wave maker. This wave maker generates both regular waves and pseudorandom waves, and can be programmed to

produce nontraditional waveforms such as wave pulses, complex periodic waves and dual and triple wave trains. The wave maker can be used to generate both regular and irregular waves with heights up to 20 inches.

FFREY C. DEY — PRESIDENT AND CHIEF EXECUTIVE OFFICER

Experience Summary

- 19 year of experience as an environmental geologist and subsurface remediation professional
- 18 years of progressive responsibility at project geologist, project manager, project director, territory manager, business manager, and president and CEO
- Developed several business models to respond to customer needs in the subsurface remediation market. Lead team to develop innovative processes and procedures to bring in-situ chemical oxidation with ozone effectively and safely to the marketplace. Lead team recognized by Sears, Roebuck and Co. with award as World Class Construction Partner for work involving national natural gas conversion planning and implementation.
- 14 years as a Professional Geologist

Areas of Expertise

- President and Chief Executive Officer
- Business Management
- Innovative Technology Development
- Client Program Development/Project Director
- Project Management

Project Experience

Resource Control Corporation, 1992 – Present

As President of RCC, Mr. Dey manages and is responsible for performance of the corporation including the business and technical operations of the firm. Mr. Dey supervises RCC's preliminary assessment, subsurface investigation, remedial investigation, feasibility and pilot study, risk assessment and risk management and remediation programs. RCC develops client programs tailored to individual client requests and requirements. RCC is committed to the development of effective regulatory, remedial and management approaches that will serve our clients various needs.

Program Management Experience

Due Diligence – Preliminary Assessments/Phase 1 Site Audits. Performed Phase 1 preliminary assessments at forty-two (42) facilities undergoing property transfer or refinancing. Project management involved coordination of all facility inspections and final report preparation in six weeks from notice to proceed.

Storage System Management. Developed UST closure program for a major retailer at twenty-five (25) facilities in New Jersey, Pennsylvania, and New York. This program was coordinated for implementation over a six-month period. Developed replacement program for forty-five (45) locations nationally and replaced and installed upgraded systems at twenty (20) locations throughout the eastern US for a major telecommunications firm

Hydraulic Lift Removal. Assisted client in development of a hydraulic lift removal program for hundreds of facility locations nationally. RCC managed these lift removals nationally and performed environmental assessment and consulting associated with the lift removals in the Mid-Atlantic Region involved successful negotiation with regulators on site specific remediation standards for soil above default standards promulgated or used as guidelines in the various states.

Remedial Action. Supervised the successful preparation and implementation of numerous Remedial Action Plans throughout the Mid-Atlantic Region. RCC has utilized innovative applications and combinations of soil venting, bioventing, bioremediation, air sparging, multi-phase extraction, in-situ chemical oxidation, limited biosparging and monitored natural attenuation (MNA) remedies to design efficient remedial systems and strategies to obtain site closure for commercial, industrial and government customers. RCC has implemented both conventional and innovative remedial technologies that have successfully remediated hundreds of sites throughout the eastern United States.

Project Management/Project Experience

Remedial Alternatives Evaluation, Remedial Design, Construction and Operation. Project Director for major chlorinated solvent plume remedial action. PCE, TCE, DCE and VC were all present in soil and groundwater beneath and adjacent to a 20,000 ft metal fabrication facility in NJ. This remedial action included excavation and treatment of sediments and soils within a wetlands area surrounding a small stream behind the facility. The in situ soils and groundwater plumes are being treated with a large ISCO system injecting ozone into the subsurface beneath and adjacent to the facility. RCC conducted this project under and fixed fee lump sum to closure contract. The project is currently entering the third quarter of O&M and is on budget. Cessation of active remedial efforts is expected to occur in 2005 after significant reduction in the mass of constituents of concern in soil and groundwater.

Remedial Investigation and Risk Management Evaluation of PCE Release. Remedial investigation was performed around and within a 1.5 million square foot warehouse to investigate the source and extent of PCE detected in groundwater at the site. Implemented an alternate groundwater-sampling plan approved by PADEP to delineate the extent of PCE in groundwater. Utilized site-specific hydrogeologic data to model the fate and transport of Dissolved Phase PCE. Received site closure based on the groundwater modeling and assessments documenting the levels of PCE in groundwater were protective of public health and the environment. The risk management and alternate groundwater sampling approach saved an estimated 50% of total project costs as compared to more conventional groundwater sampling and assessment procedures.

Remediation Design of Multi-Phased Hydrocarbon and Solvent Plumes. Performed three phased site characterization to assess the extent of a multiple source mixed type petroleum hydrocarbon spill. Site characterization included geophysical investigation, Gore Sorber soil gas screening survey, groundwater and soil sampling, hydrogeologic testing and evaluation, remedial alternative pilot testing, groundwater modeling, and mass balancing. The site characterization led to the design of an aggressive insitu bioremediation remedial action plan (RAP). This RAP included groundwater extraction and reinjection, vapor extraction, air sparging, and nutrient additional. These remediation technologies are implemented concurrently to support the bioremediation of subsurface petroleum hydrocarbon compounds. The site characterization and remedial action design allowed for the transfer of approximately 42 acres of industrial property for subsequent redevelopment. A large retail facility was constructed on top of approximately 2/3 of the subsurface remediation system components.

Soil Remedial Assessment and Remediation in Wetlands. Petroleum and solvent impacted soils at an upstate New York storm water drainage site were remediated using excavation and off-site disposal. Site contamination was caused by petroleum, solvent and metals-containing oil/water separator over flow

draining into another property owner's parcel through a storm water pipe. Sediments in the drainage area were impacted at various depth horizon's up to 3-feet below grade. Following installation of a storm water diversion system, the drainage area was de-watered, and remedial excavation proceeded. Excavation utilizing a bulldozer and a track-hoe excavator was conducted. Field immunoassay analysis provided real-time post-excavation results, allowing the remediation to proceed efficiently. Laboratory analysis of post-excavation sediment samples provided final closure documentation. This project required workplan review by the Army corps of Engineers, and the US EPA for jurisdictional determination. RCC had developed the NYSDEC approved remedial action workplan using a combination of soil excavation and bioremediation. Upon initiation of the soil excavation phase of the approved workplan, RCC's project engineer, project hydrogeologist and project manager recognized and evaluated the effect new site data may have on the success of the approved workplan. The remedial alternatives analysis was re-evaluated based on the new site data. It was determined that 4xcavation and disposal of all the soild would be the remedial option which would be most protective of public health and the environmental and most cost effective. Client and NYSDEC approval for the modification to the workplan were granted quickly. Site closure was obtained for this site after completion of the remedial action workplan on time and on budget.

Hydrogeologic Assessment and Remediation of Pipeline Breaks. Remedial investigation to determine the extent of hydrocarbon plume formed after a large volume of jet fuel was lost at a pipeline break. Specific duties include budget preparation, project planning, and coordinating of personnel, as well as client reporting. After the proposed RI/FS Workplans and Remedial Action Workplan were accepted by New Jersey Department of Environmental Protection the RAW was implemented. The recovery system incorporates various technologies, including bioremediation and soil venting, to produce a cost-effective and efficient remedial alternatives. Groundwater cleanup criteria for this remedial action plan were met within estimated timeframes.

Immediate Response Installation of Comprehensive Site Remediation System. Ten thousand gallon surface spill of gasoline into recharge area of a sole source aquifer. Managed emergency remedial investigation design and installation of emergency hydraulic control system and design and installation of comprehensive vapor extraction and bioremediation system. The remedial alternative employed remediated 95% of the initial spill in approximately 16 months. Site closure was approved by the NJDEP approximately two years after the date of the spill.

NJDEP Approved Site Closure. Achieved site closure on two facilities with diesel contamination in order to effectuate property transfers utilizing public health and environmental assessment achieved elevated cleanup criteria to enable reduction in amount of remediation required to achieve site closure.

Implementation of Remedial Action Plans. Project management and supervision during implementation of remedial actions, installation of remedial systems and remediation system monitoring and maintenance.

CERCLA Project Geologist. Collected and reported results of project soil and groundwater sampling consistent with CERCLA-NCP procedures.

RCRA Closure. Managed RCRA surface impoundment closure in accordance with RCRA Regulations and NJDEP Bureau of Hazardous Waste Engineering regulatory personnel.

Hydrogeologic Remediation of Environmentally Sensitive Site. Frequent sampling, analysis, and monitoring of equipment performance demonstrated effective and efficient recovery of a gasoline loss in the Pine Barrens.

Design and Permit. Centrally located soil bioremediation facility. Designed an above ground soil bioremediation and recycling facility. Developed a facility wide design, permit program, site safety plan and emergency procedure guidelines.

Employment History

- **President and CEO,** Resource Control Corporation, Moorestown, NJ 1992-Present
- **Director of Operations**, Delaware Soil Management, Burlington, NJ 1991-1992
- **Territory Manager/Project Manager,** Groundwater Technology, Inc., Trenton, NJ 1985-1992

Education

BS, Geology, Hydrogeology, University of Delaware

Graduate studies in Hydrogeology and Groundwater Pollution, Rutgers University

Technical Skills, Certification and Training

- Professional Geologist – Registered with the State of Delaware - #707
- NJDEP Certified N-2 Industrial Waste Water Treatment System Operator, License #0021
- NJDEP Certified UST Closure Manager, #0010082
- NJDEP Certified UST Subsurface Evaluator, #0010082
- NJDEP Certified Test Borer No. B0280
- PADER Certified UM-R Installer
- Completed 40-hr. Hazardous Site Safety Training Course, meeting the requirements of 29 CFR 1910.120
- Completed 8-hr. Hazardous Site Safety Training Course, meeting the requirements of 29 CFR 1910.120
- Completed 24-hr Hazardous Materials Emergency Response Course

Professional Organizations

- National Ground Water Association
- New Jersey Water Well Association
- New Jersey Water Pollution Control Federation
- American Society Testing & Materials
- National Association of Environmental Professionals
- TEC – Group #493

Clearances

None

Awards and Achievements

- Sears – In recognition for being a Sears Construction World Class Partner, 1998.

Publications and Periodicals

Dey, Jeffrey C., Rosenwinkel, Paul A., and Wheeler, Kevin P., *In Situ Remediation of MTBE Utilizing Ozone, Remediation Journal; Wiley Periodicals, Inc.,* Winter 2002

Presenter: *Design and Implementation of a Highly Integrated and Automated In Situ Bioremediation System for Petroleum Hydrocarbons,* (Dey, Norris and Rosenwinkel) *Hazwaste World Superfund XVII,* October 1996.

The Advantages of concerted Bioremediation of Lightly contaminated Sites Compared toIntrinsic Bioremediation. (Norris, Dey and Shine) *I & EC Special Syposium, American Chemical Society, Atlanta, GA,* Septemer 27-29, 1993.

Presenter: *Integrated Site Remediation combining Groundwater Treatment, Soil Vapor Recovery and Bioremediation.* (Dey, Brown and McFarland) Superfund Conference, Washington, D.C., 1990.

Joseph P. Weatherby

Born - Woodbury, NJ
Home: Key West, Florida

Mr. Weatherby has been involved in the boating and tourism industry since childhood. He grew up at a marina owned by his father. He gave sailing and fishing lessons, conducted repairs of both sail and motor driven vessels and was involved in the management of the business.
After college Mr. Weatherby became part owner of a dive charter business (Looker Diving) in Key West, Florida, which offered its clientele the very cutting edge of SCUBA diving. Wreck diving, reef diving, deep diving and spear fishing were just some of the choices at Looker.

After ending his relationship with Looker Mr. Weatherby worked in New Jersey With Dean Witter Reynolds. His duties at Dean Witter included locating and transacting business with high net worth clients and subsequently managing their financial assets. At Dean Witter, Mr. Weatherby became adept at raising capital for the different offerings that were appropriate for his clients. He also built an extensive network of contacts with the ability to finance various projects, both public and private. This network includes not only funders, but also expertise in specialized areas.

In 1994, Mr. Weatherby left Dean Witter to work on the project that has become Reef Makers, and again became involved in the local Key West diving business. Mr. Weatherby holds a 100-ton United States Coast Guard Master's license with auxiliary sail and towing endorsements. He is a PADI SCUBA diving instructor, a certified gas blender, a DAN oxygen provider instructor and a medic/first aid CPR instructor. He is very experienced with local diving geography and conditions and has enlisted the active support of all of the local experts to ensure the successful completion of the Vandenberg project.

RESUME

Michael S. Bruno
Director, Davidson Laboratory
Professor, Department of Civil, Environmental, and Ocean Engineering
Stevens Institute of Technology, Hoboken, New Jersey 07030
e-mail: mbruno@stevens-tech.edu
phone: (201) 216-5338

EDUCATION

ScD. Civil-Ocean Engineering Massachusetts Institute of Technology - Woods Hole Oceanographic Institution 1986

M.S. Civil Engrg University of California at Berkeley 1981

B.S. Civil Engrg New Jersey Institute of Technology 1980

PROFESSIONAL REGISTRATION

Registered Professional Engineer in the State of New Jersey

SCUBA Instructor (PADI and NAUI certifications)

POSITIONS

Director, Davidson Laboratory 1989 - present

Professor, Stevens Institute of Technology 1998-present

Associate Professor Stevens Institute of Technology 1989-1998

Assistant Professor New Jersey Institute of Technology 1986-1989

Principal Engineer New Jersey Bureau of Coastal Engr. 1981-1982

Director, New Jersey Coastal Protection Technical Assistance Service

Member, State of New Jersey Beach Erosion Commission

Editor-in Chief, Journal of Marine Environmental Engineering, Gordon & Breach

Secretary-General - Pan American Federation of Coastal and Ocean Engineers

Member, New Jersey Maritime Advisory Council

HONORS AND AWARDS

Fulbright Scholar, 1996 (appointment at University of Thessaloniki, Greece)

Office of Naval Research ***Young Investigator Award***, 1991

Outstanding Service Award, American Society of Civil Engineers, 1988

James Robbins Award for excellence in teaching, N.J. Inst. of Tech. 1986 - 1987

PROFESSIONAL SOCIETIES

Society of Naval Architects and Marine Engineers

American Society of Civil Engineers

American Geophysical Union

American Shore and Beach Preservation Association

The Oceanography Society

PROFESSIONAL EXPERIENCE

Area of specialization is hydrodynamics, with particular emphasis on physical and numerical modeling of wave dynamics, sediment transport, and coastal structures.

PROFESSIONAL ACTIVITES

Editor-in-Chief, Journal of Marine Environmental Engineering, Gordon and Breach Science Publishers.

Secretary General - Pan American Federation of Coastal and Ocean Engineering.

Member, New Jersey Beach Erosion Commission (Governor appointment)

Member, New Jersey Maritime Advisory Council.

Member, Executive Committee, Society of Naval Architects and Marine Engineer N.Y. Metropolitan Section, 1994 - 1997.

Member, Board of Trustees, New Jersey Marine Sciences Consortium.

Member, Board of Directors, Hudson River Environmental Society

Member, National Research Council Committee on Oil Spill Countermeasures,
1995-1997.

Member, Management Plan Advisory Committee,PSE&G Wetlands Restoration Project, 1994-present.

Member, National Science Foundation scientific exchange program with Latin America, 1992-1993.

Member, Technical Program Committee, 1992 Offshore Mechanics and Arctic
Engineering Conference, ASME, Calgary

Co-Chairman - 21st Conference of Pan American Federation of Engineering
Societies, Coastal and Ocean Engineering Section,
Washington, D.C., August 19-24, 1990

ACADEMIC ACTIVITIES

Coordinator, Ocean Engineering Graduate Program
Director, Stevens Scholars Program
Stevens Institute of Technology, 1989 - present.

Thesis Supervisor:

PhD - Ms. Kathryn Ketteridge, The Influence of Grain Size on Cohesionless Sediment Transport Dynamics under Waves. September, 2001.

PhD – Mr. Xiao Li, A Hydrodynamic and Sediment Transport Model for Nearshore Coastal Regions. August, 2001.

PhD – Mr. Hugh Roarty, A Photographic Technique for the Measurement of Bedload Sediment Transport. April, 2001.

PhD. - Mr. Thomas Herrington, Analysis of Dominant Forcings in the Vicinity
of a Tidal Inlet and Submerged Artificial Reef. June, 1996.

PhD. - Mr. Raju Datla, Interaction Between Submerged Turbulence and
Surface Waves. June, 1996.

PhD. - Ms. Jennifer Waters, The Generation of Internal Waves by Sea Ice.
May, 1995.

PhD. - Mr. A.K.M. Quamrul Ahsan, Three-Dimensional Modeling of Coastal
Pollution Transport. January, 1993.

PhD. - Mr. Won Cho, Experimental Investigation of Surface Wave Instabilities.
May, 1992.

MS - Mr. Sigmund Rutkowski, The Generation of Realistic Waveforms in
A Wave Tank, June, 1998.

MS - Mr. Kenneth Cadmus, The Influence of the Tide on Beach Profile
Evolution, June, 1998.

MS - Mr. Hugh Roarty, A Photographic Technique for the Measurement of
Suspended Sediment Transport, May, 1998.

MS - Mr. Walter McKenna, The Effect of Man-Made Structures on Shoreline
Changes at Atlantic City, New Jersey, May, 1997.

MS - Mr. Sherif Hassan, The Effect of a Shore-Parallel Reef on Mixing
Rates in the Nearshore Region. May, 1996.

MS - Mr. Jun Yang, Laboratory Study of Wave Forces on a Submerged
Stone Breakwater. May, 1996.

MS - Ms. Katherine Ketteridge, Laboratory Study of The Influence of Sand
Permeability on Cross-Shore Transport. December, 1996.

MS - Mr. Jesse Falsone, Following Sea Behavior of America's Cup Class
Sailboat. May, 1994.

MS - Ms. Kelly Rankin, Wave Transformation Over a Submerged Reef.
May, 1994.

MS - Ms. Jennifer Waters, Laboratory Investigation of Sea Ice Dynamics.
May, 1993.

MS - Mr. Thomas Herrington, Hydrodynamic Analysis of Artificial Reefs.
May, 1992.

MS - Mr. Christopher Obropta, Sediment Transport Along Northern

New Jersey.

June, 1988.

James Leslie Straith

Born- September 25/50 Detroit, Michigan

home : North Vancouver, British Columbia

Jay Straith has been a active scuba diver since 1981 and has dived in areas ranging from the cold waters of his native British Columbia to the reefs and wrecks of Papua New Guinea and Truk Lagoon. He was President of Artificial Reef Society of British Columbia from 1989 to 2001 during which he initiated and guided seven large artificial reef projects to completion in British Columbia. These projects ranged from a 700 ton freighter to the 10,500 ton HMCS Cape Breton which was the largest diving artificial reef when sunk in 2001.

Jay has worked internationally with groups in the United States, Australia and New Zealand in establishing successful artificial reef projects including the recent deployment of two 475 foot "Adams Class" destroyers. He has provided leadership in developing the diver safety aspects of modern diver oriented artificial reefs and established a industry standard for safety. Jay has spoken at the invitation of DEMA at it's international retailers and manufacturers shows in 1998, 2000 and 2002. He has also presented at scientific conferences of artificial reef development. Jay works as a trial lawyer and does work for the Canadian Department of Fisheries and Oceans, Environment Canada ,the Canadian Department of Justice and private work from his offices in North Vancouver, British Columbia.

During this time Jay spearheaded the liaison work with the regulatory agencies in Canada and worked to develop the first set of internationally accepted environmental standards for environmentally responsible ship preparation. These "Canadian Standards" have evolved to be the benchmark for artificial reef projects around the world."

He also provided key judgement and guidance with government and non government groups working with the Artificial Reef Society, which proved vital in establishing a united team approach.

During the seven British Columbia projects there were zero significant industrial accidents among the professional and volunteer workers on the ships.

References:
Dixie Sullivan at Environment Canada
Staff Sargent Ken Burton of the Royal Canadian Mounted Police

Wesley Frederick Roots

Burnaby British Columbia
Home : Coquitlam, British Columbia

Letter of experience for Wes Roots,

-Businessman
-Marine Contractor
-British Columbia Government Trade Qualified Shipwright

Ship Cleaning and Scuttling Projects

July 2003
Rimouski, Quebec Canada
Ex H.M.C.S. Nipigon
Placed on schedule upright
376' 2,800 ton ex Canadian Naval Helicopter Destroyer
- -Responsible for client meeting Government Environmental Specifications
- -Responsible for towing gear
- -Anchoring vessel on sink site
- -Sinking dynamics
- -Placement of vessel at sink site

-Oct 2001 Snake Island Nanaimo B.C.
Ex H.M.C.S. Cape Breton
441' 10,000 ton WWII ex Canadian Naval Ship
- -Responsible for **all** aspects of Environmental cleaning to Environment Canada specifications
- -Responsible for cutting plan and ballasting for sinking plan

-June 1997
Ex H.M.C.S. Saskatchewan
376' 2,800 ton ex Canadian Naval Destroyer
- -Management of entire project from
- -acquisition
- -towing
- -moorage
- -salvage
- -environmental cleaning
- -diver preparation

-worker safety
-towing to sink site
-scuttling management
-post sinking

-June 1996
Ex H.M.C.S. Columbia
376' 2,800 ton ex Canadian Destroyer
-Management of entire project from
-acquisition
-towing
-moorage
-salvage
-environmental cleaning
-diver preparation
-worker safety
-towing to sink site
-scuttling management
-post sinking

September 1995
Ex H.M.C.S. MacKenzie
376' 2,800 ton ex Canadian Destroyer
-M
anagement of entire project from
-acquisition
-towing
-moorage
-salvage
-environmental cleaning
-diver preparation
-worker safety
-towing to sink site
-scuttling management
-post sinking

Year 1998 - 1999
Ex H.M.C.S. Yukon
376' 2,800 ton ex Canadian Destroyer
-ship acquisition
-environmental preparation
-preparation for open water towing to San Diego
-towing
-environmental assessment

I was **not** involved in placing this vessel

Year 2000
Ex H.M.C.S. Kootenay
376' 2,800 ton ex Canadian Destroyer
- -ship acquisition
- -prepare for open ocean towing
- -water tight integrity
- -towing gear
- -initial Hydro Carbon cleaning

Year 2000
Ex H.M.C.S. Restigouche
376' 2,800 ton ex Canadian Destroyer
- -ship acquisition
- -prepare for open ocean towing
- -water tight integrity
- -towing gear
- -initial Hydro Carbon cleaning

I have managed Artificial Reef preparation in British Columbia since 1994. The consequential development of economical and environmentally friendly techniques are my pride and joy.
The techniques we have developed include:
-low energy use hydro-carbon cleaning
-an extensive network of secondary users for shipboard equipment
-an extensive network of buyers and recycling companies for most surplus materials onboard
-efficient shipboard management
-our research has found some very "Bio-friendly" cleaning materials
-our sink site techniques and preparation include:
-low cost proper ballasting
-proper trimming of vessel
-proper horizontal and vertical ventilation
-anchoring techniques
-experienced "expert" explosive personnel
-well designed hull cutting

All this combined to provide:
-a quick sink
-on target
-upright or on side if required
-on schedule

I work in close association with partners

Jay Straith

Roy Gabriel
Marine explosives expert

References:

Dixie Sullivan
Environment Canada
(604) 666-2730
Cmdr. Daryl Hansen
Environmental Consultant Environment Canada
(250) 721-2153

Ian Hall
Nanaimo Dive Association
Saskatchewan and Cape Breton projects
(250) 751-4966

Jean Pierre Bouillon
R.A.E.Q.
Rimouski Quebec, Canada
(Nipigon Project)
Numbers available upon request

Roy Earl Gabriel
112 -125 West 19th Street,
North Vancouver, B.C., Canada, V7M 1X4

Profile

- Thirty-seven years as a technical explosives specialist with the Royal Canadian Mounted Police and the Canadian Military.
- Experienced in all applications, methods and techniques utilized in the explosives field.
- Explosives field investigator, trainer with strong interpersonal and communication skills.
- National lecturer and public speaker.
- Pioneer in leading edge technologies in the explosives field.
- Special effects pyrotechnician.

PROFESSIONAL EXPERIENCE

Explosive Technologist - Technical Specialist 1990 - Todate

- Developer of the accepted explosive scuttling procedure to scuttle (sink) the ships used to create Artificial Reefs world wide.
- Technologist responsible for explosive scuttling of five Canadian Destroyers as Artificial Reefs in British Columbia. HMCS Cape Breton (2001) HMCS Saskatchewan (1997) HMCS Columbia (1996) HMCS McKenzie (1995) HMCS Chaudiere (1992)
- Technologist responsible for explosive scuttling of HMAS Swan (1997) in Western Australia and associated pyrotechnic display.
- Technologist responsible for explosive scuttling of HMNZS Waikato (2000) Tutukaka, New Zealand.
- Technologist responsible for explosive scuttling of HMAS Perth (2001) in Western Australia
- Technologist responsible for explosive scuttling of HMAS Hobart (2002) in Southern Australia
- Technologist responsible for projected scuttling in 2003 HMCS Nipigon in Gulf of St Lawrence, Canada - Lena in Western Australia - South Tomy in Western Australia

Special Effects Assistant - Motion Film Industry 1998 – to date

- Shop foreman for International Special Effects LTD
- Welder fabricator
- Pyrotechnician
- On set - first assistant

Consultant - Technical Specialist 1997 – to date

ExRT Ltd -Explosives and Rockwork Technologies Ltd

- Provides state of the art explosive services to industry; undertake explosive implosion, explosive demolition on reinforced concrete and steel structures, marine structures and ships, explosive design review and analysis.
- Undertakes and conduct pre and post inspections, on civil, commercial and residential structures. Monitor and evaluate blasting activities utilizing state of the art electronic seismographs, high-end video cameras, computer simulations and analysis.
- Reviews and investigates both the potential for and actual blast induced damage to structures on behalf of contractors, industrial clients and insurance companies.

Special Constable/ Explosive Technologist 1981-1997 (retired)
Explosive Disposal Unit
Royal Canadian Mounted Police, Vancouver,

Responsibilities:

- Responded to the criminal use of explosives throughout British Columbia. Assisted R.C.M.P. and municipal police forces in follow-up investigations of improvised explosives devices (I.E.D.) or threats.
- Assisted police in preparing cases for prosecution and act as an expert witness in all explosive-related matter in municipal or the Supreme Court.
- Assisted Emergency Response teams in armed stand off and hostage rescue.
- Managed the disposing of damaged or dangerous explosive material for the public.
- Skilled in the use and maintenance of Explosive Disposal Unit (EDU) equipment including:
  X-ray and fluoroscope, robotics equipment, electronic vapor detector bomb truck and equipment, associated equipment. Managed, maintained and upgraded R.C.M.P. EDU / ERT explosive entry hostage rescue training center. Maintained complete inventory of all EDU's explosive magazines Controlled the use of and maintain and upgrade the R.C.M. P. Disposal Unit's bomb disposal range.

Assistance to Other Agencies:

Provided technical and investigative assistance to the Chief Inspector of Explosives (Natural resources Canada) regarding the illegal importation, possession and storage of explosives. Assisted in the formulation and utilization of security plans for VIP visits and major international events such as the Summit Conference and Commonwealth Games. A member of the security team to ensure the safety of the public and visiting dignitaries during the visit or event.

Teaching and Public Relations Experience:

Instructed explosive entry tactics to Emergency Response Teams. Detonating cord and all high explosives relating to the explosive entry field were employed. Full range of pyrotechnics and diversionary charges were deployed to make the training scenarios realistic. Taught explosive recognition and

bomb threat planning and response courses to the R.C.M.P., municipal and city police forces. Lectured province-wide to companies, schools and public facilities on bomb threat planning and explosives recognition.

- Presented informational seminars to senior management and security personnel in companies such as MacMillan Bloedel, B.C. Hydro, B.C. Telephone, B.C. Ferries and B.C. Transit.
- Lectured and instructed to the R.C.M.P. Bomb Disposal School in Ottawa.

Significant Achievements:

- Awarded Commissioner's Commendation for actions during "Gustafen Lake Armed Standoff' in August/September 1993
- Invented a frame that is utilized in conjunction with explosives for breaching structures for hostage rescue work. Now manufactured and distributed worldwide under trade name of Hydro Cut.
- Designed and built a track that allows the Remote Mechanical Investigator robot (R.M.I.) to climb and negotiate stairs and steep inclines. Now manufactured commercially sold worldwide.
- Developed the accepted explosive cutting procedure to scuttle (sink) ships used in creating artificial reefs world wide.

Previous Positions:

Underwater Demolition Specialist / Deep Sea Diver 1960 - 1981

Sergeant - Navy Bomb Disposal 1980 - 1982

Sergeant- Instructor 1977 – 1980

Bomb Disposal School, Canadian Armed Forces Base,
Borden, Ontario
Master Corporal / Sergeant 1976 –1977

Research and Experimental Diving
Defense and Civilian Institute of Environmental Medicine
Canadian Forces Base, Toronto, Ontario

Corporal / Able Seaman 1960 -1966
Engineering Branch
Canadian Forces Base, Esquimalt, B.C.

Certificates and Special Courses:

Natural Resources Canada Pyrotechnic Card
Special Effects Pyrotechnician
Expires February 2003
WCB Commercial Blasting Certificate Vancouver
Safety Fuse / Electric Multi-series

Explosive Entry / Explosive Disposal
Expires July 23, 2003
Explosive Validation Courses, 1979, 1985, 1992 Ottawa
Explosive Entry Instructors Course, 1991 Ottawa
Explosive Vapor Detection Course, 1988 Ottawa
Radiography Course (X-ray), 1984 Ottawa
Arson Investigators Course, 1981 Victoria
Clearance Diver TG4 Course, 1979 Halifax
HC Course (Advanced Explosive) 1976 Ontario
Master Diver Courses He02, 1976 Washington
Instruction Technique Course, 1976 Ontario
Advanced Fire Leader Course, 1976, 1970 Victoria
Hull Mechanic (Engineering) 1960, 1961, 1964 Victoria
St. John's Ambulance Industrial First Aid Instructors Course, 1976 Victoria
First Aid Level 1 WCB, current Sechelt
Canadian Fire Arm Safety Course, current Vancouver

<u>Practical Experience:</u>

- Extensive use of explosive cutting tape (ECT) and Linear Shaped Charge
- Drilling and rock blasting, above ground and under water
- (LSVC) in explosive cutting / demolition. Above ground and under water.
- Ice blasting and beach clearance in the Arctic and DEW Line. 8 weeks in the summer for 4 consecutive years.
- Stump and tree removal
- Experienced in use of most explosive products used in industry.
- Welding and fabricating
- Commercial diving, surface supplied and mixed gas
- Robotics

February 12, 2004

William Horn
Fishery Biologist IV
Florida Fish and Wildlife Conservation Commission
Division of Marine Fisheries
620 South Meridian Street, Box MF-MFM
Tallahassee, Florida 32399-1600

RE: USS Hoyt Vandenberg Artificial Reef Project

Dear Bill,

On behalf of the City of Key West and Artificial Reefs of the Keys, Inc. (ARK) this letter is in response the Florida Keys National Marine Sanctuary (FKNMS) letter dated December 16, 2003.

Consistent with the letter, please amend the language in our draft vessel transfer agreement as follows. Part XI a. should be corrected to state that placement of objects on or disturbance of the seabed in the FKNMS is prohibited without a permit or authorization of a permit, rather than as previously stated, "FKNMS regulations do not prohibit artificial reefs".

Please contact me at 856-273-1009 ext 24 or Joe Weatherby at 305-797-7077 with any questions you may have regarding the project.

Sincerely,

REEFMAKERS

Jeffrey C. Dey
President and CEO

Cc: City of Key West
C. Norwood (ARK)
A. Greir (RCC)

ENVIRONMENTAL ASSESSMENT

Creation of an Artificial Reef within the Florida Keys National Marine Sanctuary

Key West, Florida

Prepared by:
REEFMAKERS (first Draft) for the
Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service
National Marine Sanctuary Program
1305 East West Highway, 11th Floor
Silver Spring, Maryland 20910

March 2004

TABLE OF CONTENTS

1.0 PURPOSE AND NEED FOR THE ACTION

1.1 BACKGROUND

National Marine Sanctuary Program

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Sanctuary Program (NMSP) manages a national system of 13 sites that protect over 13,000 square nautical miles of marine resources, and range in size and shape from 0.25 to 4024 square nautical miles. The mission of the NMSP is to serve as the trustee for this system of marine protected areas, and to conserve, protect, and enhance their biodiversity, ecological integrity, and cultural legacy. Its goals are appropriate to the unique diversity contained within individual sites. They may include restoring and rebuilding marine habitats or ecosystems to their natural condition or monitoring and maintaining already healthy areas.

The National Marine Sanctuaries Act (16 U.S.C. 1431 *et seq.;* NMSA) authorizes the Secretary of Commerce to designate and manage areas of the marine environment with nationally significant aesthetic, ecological, historical, or recreational values as National Marine Sanctuaries. The primary objective of this law is to protect marine resources, such as coral reefs, sunken historical vessels or unique habitats, while facilitating all public and private uses of those resources that are compatible with the primary objective of resource protection. Sanctuaries, frequently compared to underwater parks, are managed according to Management Plans, prepared by the NMSP on a site-by-site basis.

Florida Keys National Marine Sanctuary

The Florida Keys National Marine Sanctuary (FKNMS) was designated when the President signed the Florida Keys National Marine Sanctuary and Protection Act of 1990 (hereafter referred to as the Act). The purpose of the Act is to protect the marine resources of the Florida Keys, to educate and interpret for the public the Florida Keys marine environment, and to manage human uses of the Sanctuary consistent with the policy of the United States to protect and preserve living and other resources of the Florida Keys marine environment. The Act directed NOAA to develop a comprehensive management plan and implement regulations to protect Sanctuary resources. In developing this plan the Act required NOAA to: facilitate all public and private uses of the Sanctuary consistent with the primary objective of resource protection; consider temporal and geographic zoning to ensure protection of Sanctuary resources; ensure coordination and cooperation between Sanctuary managers and other Federal, State, and local authorities with jurisdiction within or adjacent to the Sanctuary; and other requirements that can be found in the Act (P.L. 101-605).

The Sanctuary is administered by the National Oceanic and Atmospheric Administration (NOAA), under the Department of Commerce, and is managed jointly with the State of Florida under a co-trustee agreement. Pursuant to the agreement, the Florida Department of

Environmental Protection was designated as the State partner for Sanctuary management by the Governor and Cabinet sitting as the Board of Trustees for the State of Florida.

The Florida Keys encompass a fragile ecosystem of mangrove forests, sea grass beds and coral reefs. The Sanctuary contains over 2,900 square nautical miles of state and Federal waters and bottomlands. It serves as a protective habitat for the wide variety of natural and cultural resources found in the area. The Sanctuary boundary extends southward on the Atlantic Ocean side of the Keys from the northeastern most point of the Biscayne National Park along the approximate 300-foot isobath for over 200 miles to the Dry Tortugas. From there it turns north and east, encompassing a large portion of the Gulf of Mexico and Florida Bay, where it adjoins the Everglades National Park boundary. The landward boundary is the mean high water mark.

The FKNMS Final Management Plan and regulations were adopted in July 1997 after a six-year planning process, and serve as the framework for the conservation of this large marine area. The Management Plan outlines ten action plans or strategies for conserving, protecting, and managing the significant natural and cultural resources of the Florida Keys marine environment. These action plans are largely non-regulatory in nature and involve educating citizens and visitors, using volunteers to build stewardship for local marine resources, appropriately marking channels and waterways, installing and maintaining mooring buoys for vessel use, surveying submerged cultural resources, and protecting water quality. The Sanctuary Management Plan also designated five types of marine zones to reduce pressures in heavily used areas, protect critical habitats and species, and reduce user conflicts. The efficacy of these marine zones and other biological and chemical parameters are monitored Sanctuary-wide under the Sanctuary's Research and Monitoring Action Plan. Overall, the Sanctuary management regime uses an ecosystem approach to comprehensively address the variety of impacts, pressures, and threats to the Florida Keys marine ecosystem.

Artificial Reefs in the Florida Keys

Artificial reefs are addressed in the FKNMS Regulatory, Research and Monitoring, and Volunteer Action Plans. FKNMS regulations prohibit, with some exceptions, the alteration of the seabed and the deposit of materials on the seabed without a permit. 15 CFR 922.163(a)(3) and (4). In addition, the FKNMS regulations were designed to avoid duplicative permitting among competent authorities while providing for permit consistency with the FKNMS responsibility to protect the marine resources of the Florida Keys. See 15 CFR 922.163(c) and (d), 922.167. The United States Army Corps of Engineers (ACOE) also has purview over the issuance of permits for the placement of artificial reef material through their authority under the Rivers and Harbors Act (33 U.S.C. § 401 *et seq.*). The ACOE has issued a permit to the City of Key West (ref #?) for the placement of the '520 surplus military vessel General Hoyt S. Vandenberg (the Vandenberg) in Sanctuary Waters as an artificial reef

Artificial Reefs have been used extensively in Florida, other coastal states, and internationally to serve as structure for fishing and diving activities. Monroe County, FL has 48 artificial reefs that are located from 2.3 to 19.5 nautical miles from shore. The reef material ranges from concrete rubble to historic ships. The ACOE has the authority to issue permits for these activities in

United States coastal waters and has developed permitting conditions consistent with environmental assessments of their impacts on the marine environment. Among these conditions are restrictions on the types and qualities of materials that can be deployed. Since implementation of the FKNMS regulations, there have been two approved deployments of artificial reef structures within the Sanctuary boundary to serve as recreational diving or fishing locations. Several other artificial reefs were in existence prior to the Sanctuary's designation in 1990 and subsequent regulations in 1997. Three of these sites are part of the FKNMS' educational Shipwreck Trail.

There is considerable debate among the resource management and scientific community on the benefits and effects of artificial reefs to marine resources. A similar debate is on-going related to the ability of these structures to serve as a resource management tool to decrease visitor pressure on natural reef areas. In recognition of this uncertainty, the FKNMS regulations and Management Plan require a careful analysis of any long-term placement of material on the seabed.

1.2 NEED FOR THIS ENVIRONMENTAL ASSESSMENT

The FKNMS proposes to issue a permit (under its authority in 15 CFR Part 922.166) to the City of Key West to allow them to place the Vandenberg on the seabed within the FKNMS to create a permanent artificial reef. TheVandenberg is a 520 foot surplus military vessel. The issuance of this permit constitutes a final agency action and is thus subject to requirements of the National Environmental Policy Act (NEPA). NOAA Administrative Order 216-6 sets forth the policies for implementation of NEPA by NOAA agencies. NAO 216-6 does not list any categorical exclusion with which the issuance of a permit to create an artificial reef would be consistent. Therefore, ReefMakers (do we define who we are?) has prepared this assessment to document the impacts of its decision.

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

This assessment provides the following information:

- A description of the proposed action and alternatives.
- A description of the environmental and socioeconomic resources in the area that may be affected by the proposed action.
- A discussion of the potential effects of the proposed action on the environmental and socioeconomic resources of the area.

This assessment is based on existing information, reports, and data. The FKNMS recognizes that the ACOE has met their obligations under the NEPA through preparation of an Environmental Assessment for the issuance of SAJ-50, a regional general permit for artificial fishing reefs in Florida waters (personal communication, Stuart Santos). The information contained in this document is more limited in scope to address only FKNMS responsibilities under 15 CFR Part 922 and the FKNMS final management plan. Should later information substantially change the results of the Environmental Assessment, supplemental analysis will be

conducted as appropriate.

Description of Proposed action and ALTERNATIVES

1.4 SELECTION OF ALTERNATIVES

Four alternatives are considered in this assessment. A fifth alternative could be considered, which would be different materials at a different location, but this alternative is believed to be self evident by review of alternatives 2 and 3 below. The four alternatives evaluated in this environmental Assessment are as follows.

1. Alternative 1: Proposed action – placement of the Vandenberg at the selected location
2. Alternative 2: Different location – placement of the Vandenberg at a different location
3. Alternative 3: Different reef material – placement of different materials at the selected location
4. Alternative 4: No action – No placement of any materials anywhere

1.5 ALTERNATIVE 1: PROPOSED ACTION (PREFERRED)

The proposed action (alternative 1) involves the issuance of a permit to the City of Key West to allow them to sink the Vandenberg, a 520 foot surplus military vessel, on the seabed within the Sanctuary for the purpose of creating a permanent artificial reef. The proposed site for the artificial reef is over sandy bottom substrate in 140' of water, off Key West, Florida. The proposed project location is 6.5 nautical miles south of Key West in an area approximately one mile south of marker 32 off the Key West Reef Line within the Florida Keys National Marine Sanctuary. The vessel will be positioned within the following corner coordinates of a rectangular area of approximately 1000 feet by 1200 feet as follows:

NW - 24°27.70' N / 81°44.35' W
SW - 24°27.50' N / 81°44.35' W
NE - 24°27.70' N / 81°44.15' W
SE - 24°27.50' N / 81°44.15' W

The proposed placement site was derived through consultation between FKNMS and Reefmakers/ARK staff, Key West Propeller club staff who determined this to be the most suitable location that could be considered to meet the proposed objectives of the activity. The location proposed in Alternative 1 is uniquely suited for this activity as it is well to the South of the reef tract and is relatively devoid of sensitive resources in all directions while still meeting the proposed objectives for access by area residents and visitors. To meet the objectives of the project, the artificial reef must be created at depths within recreational diving limits and within a reasonable traveling distance of Key West and Stock Island. Any other site that meets those criteria would place the artificial on, or too close to, sensitive Sanctuary resources that would be destroyed by the placement of the artificial reef. Placement of the vessel on or near coral reefs or seagrass beds was not considered a reasonable alternative.

Under this alternative, the City of Key West will be responsible for the long-term maintenance and monitoring of the artificial reef. Maintenance of the artificial reef is expected to be limited to observing the placement of the ship and ensuring that it remains in place over time. The project permits will require the City of Key West to survey the ship periodically and after major storm events to make sure the ship has not moved and to take remedial action if deemed necessary by the FKNMS to protect Sanctuary resources. In addition, Artificial Reefs of the Keys (ARK) has arranged with the Florida Fish and Wildlife Conservation Commission (FFWCC) as well as Florida Keys Community College (FKCC) to conduct pre-deployment and post-deployment monitoring of the Vandenberg and adjacent natural and artificial reef sites. This alternative also includes the execution a formal monitoring plan that will document changes in fish presence, absence and abundance over time at the artificial reef and natural reefs adjacent to this area. Twenty-four reef sites will be sampled to determine any corresponding changes to fish populations on those natural reef sites. Additional studies being undertaken by the FKNMS and NOAA to document user patterns will be combined with this data to show what effect, if any, the newly placed artificial reef may have on fish community structure. More details on the specific monitoring to be performed as part of this project are included in the Vandenberg Project Monitoring Plan.

1.6 ALTERNATIVE 2: A DIFFERENT LOCATION

This alternative would involve placement of the Vandenberg in a different location. This alternative is considered impractical for several reasons. The first is that placement at an alternate location outside the FKNMS would require a location that is at a minimum 20 miles away from the current location and are too deep for routine diving and fishing thereby making access to the reef less practical and defeating the primary reason the proposed project will enable achievement of the project goals. Additionally, alternate locations within the sanctuary have softer bottom material, greater currents, less viability, and steeper grade to the seafloor. All of these features which are favorable for the selected location would be less favorable for alternative locations and thereby reduce the desirability of the artificial reef as a resource creating less demand for the artificial reef as opposed to the natural reefs. An alternate location within the FKNMS would still require pursuit of permit approval and is not recommended because the proposed alternative location was selected to maximize the positive ecological and socioeconomic impacts of the artificial reef to attract users and achieve the project objective.

1.7 ALTERNATIVE 3: DIFFERENT REEF SUBSTRATE MATERIALS

This alternative would involve placement of different materials in the same location. This alternative although practical is considered less desirable, since the proposed alternative would crate a more attractive artificial reef site and thereby maximize the probability of achieving the project objective of diverting users from the natural reefs. Alternate materials, such as large prefabricated units and concrete rubble patch reefs, can be placed as artificial marine habitats on sand bottom to greatly enhance the abundance, diversity, and biomass of fish in an area (Kruer and Causey 1992). The attraction of a large vessel, such as the Vandenberg, should create a greated demand for dive trip as opposed to natural reef dive trips. Thus the use of a large vessel

would provide for the best chance to achieve the project goals as opposed to an alternate material for artificial reef creation.

1.8 ALTERNATIVE 4: NO ACTION ALTERNATIVE

The no-action alternative involves not issuing a permit to the City of Key West to create an artificial reef. This would result in the City of Key West not being able to use the Vandenberg as an artificial reef within the FKNMS. While the City of Key West would be legally able to pursue this project for a site outside of the FKNMS boundaries under this alternative, it is very unlikely that they would because it is not possible to meet the objectives of the project for any site outside of the FKNMS.

2.0 AFFECTED ENVIRONMENT

This section describes the natural and socioeconomic environment of the proposed sinking site off Key West, Florida. There is a large body of literature describing the environment of the Florida Keys (DOC 1996). For the purposes of this assessment, FKNMS and ARK as well as volunteers staff conducted visual, bathymetric, and remote sensing surveys of the proposed area to determine the environment subject to effect by the referenced activity. The results of these surveys are incorporated into the description of the affected environment. Therefore, the discussion of affected environment is limited to the known habitat of the proposed artificial reef location. The environment affected by the no-action alternative is not (do we need to) described separately in this section, because not issuing a permit would result in the artificial reef not being placed within the boundaries of the FKNMS. Furthermore, because the seaward boundary of the FKNMS extends beyond depths accessible to recreational SCUBA divers (the boundary generally follows the 300-foot isobath), placing the ship on the seabed outside of the Sanctuary is not an option that would meet the objectives of the project. Other locations outside of the Sanctuary are too far from Key West and Stock Island to meet the objectives of the project.

2.1 PHYSICAL ENVIRONMENT

The Florida Reef Tract is an arcuate band of living coral reefs paralleling the Florida Keys. The reefs are located on a narrow shelf that drops off into the Straits of Florida. Intermittent outcroppings of hard bottom can occur seaward of the 60-90’ outer reef line, and linear deep water hard bottom outcroppings at approximately 125’ are present off some of the outer reefs of Key West. The shelf slopes seaward at a 0.06° angle into Hawk Channel, which is several kilometers wide with an average depth of 45’. From Hawk Channel, the shelf slopes upward to a shallow area containing numerous patch reefs. A series of bank reefs and sandbanks that are subject to open tidal exchange with the Atlantic Ocean mark the outer edge. The warm, clear, nutrient poor waters in this region are conducive to coral reef development.

The proposed placement location for theVandenberg artificial reef lies South southeast of marker # 32 (NOAA Chart (don’t know the chart # but I can get it)) at coordinates (need the box #s (hereafter referred to as the sinking coordinates). This area has been extensively surveyed by

FKNMS and ARK staff as well as hundreds of volunteers during a series of dives between 1997and 2004 and is known to be primarily barren sand bottom within the sinking coordinates.

The current regime of the area is subject to the effects of Gulf Stream and frontal eddies that set up seaward of the reef tract due to the landward deflection of the Gulf Stream. These eddies generally occur once per week and provide cool, nutrient enriched water to the area through core upwelling. These features move quickly through the area and result in a relatively well-flushed region with limited nutrient retention capacities (DOC 1996).

2.2 BIOLOGICAL RESOURCES

2.2.1 Benthic Community

While the Florida Keys reef tract is itself considered a bank reef system, exhaustive studies of the area have led to the delineation of eight (8) distinct habitats that include:

1. Offshore Patch Reef
2. Seagrass
3. Back Reefs/Reef Flat
4. Bank Reef/Transitional Reef
5. Intermediate Reef
6. Deep Reef
7. Outlier Reef
8. Sand and Softbottom

The proposed sinking location is a sand or soft bottom habitat with no seagrass present. Sand habitat comprises a significant proportion of the Florida Keys ecosystem and is much larger than the reef habitat. These areas occur throughout the reef tract and are comprised primarily of sediments made up of coral and *Halimeda* fragments. Interstitial organisms contribute to primary production for the ecosystem and several species of polycheate, mollusk, and echinoderm add to the overall diversity and function of the system. Epifauna are primarily echinoderms including sea stars, sand dollars, and sea cucumbers. Several mollusk species also occur in sand habitats in the region. Several survey dives made at the sinking location by FKNMS staff confirm the area to be consistent with this habitat description. In contrast to reef habitats, the area is relatively devoid of living organisms.

2.2.2 Fish Populations

The proposed sinking location, described above as sand habitat, supports relatively few fish species. The species present are, however, more common in these areas than other types of habitats within the Florida Keys ecosystem. Fish species known to inhabit sand habitat include the yellowhead jawfish (*Opistognathus aurifrons*), dusky jawfish (*Opistognathus whitehursti*), sailfin blenny (*Emblemaria pandionis*), sand tilefish (*Malacanthus plumieri*), and lantern bass (*Serranus baldwini*). Several pelagic species could also use the water column in this area during migratory periods.

There are several reef habitats with associated reef fish populations in relatively close proximity (e.g., 1250') to the proposed sinking location. Numerous studies of these populations in distinct habitats exist in the scientific literature and are referenced in Volume II of the FKNMS Final Management Plan (DOC 1996). Several other studies are on going in support of the FKNMS Zone Monitoring Program. Upwards of 500 species of fish are reported to inhabit FKNMS. Approximately 220 of these species, including commercially and recreationally important species, inhabit the reefs near the proposed sinking location.

2.2.3 Endangered and Threatened Species

The Final Environmental Impact Statement (FEIS) prepared as part of the implementation of the FKNMS regulations and Management Plan details the variety of endangered and threatened species that are found within the Florida Keys. The vast majority of these species are plant, terrestrial, or avian species that are not found in or around the proposed sinking location. No endangered or threatened species are known to utilize this area as primary habitat for foraging, breeding, or resting nor has this area been designated as critical habitat. There is potential for interaction with state- or Federally-listed marine mammal and sea turtle species that likely travel through or nearby this area during some phase of their life cycle. These species include the Atlantic green turtle, Atlantic hawksbill turtle, Atlantic loggerhead turtle, Atlantic Ridley turtle, Leatherback turtle, Fin whale, Right whale, Sperm whale, and Sei whale. Refer to the FKNMS FEIS for additional information on these and other state- or Federally-listed species.

2.3 SOCIOECONOMICS

2.3.1 Natural and Artificial Reef Value and Tourism

There have been extensive studies and associated reports generated on the socioeconomic condition of the Florida Keys in relation to both natural and artificial reefs. The FKNMS FEIS contains information on all aspects of the affected human activities and uses of the Keys' marine environment in relation to the previously proposed FKNMS regulations and Management Plan. More recently, a socioeconomic study of the reefs in Southeast Florida (Johns et al. 2001) included a comprehensive socioeconomic evaluation of natural and artificial reefs in Monroe County, FL. These detailed studies indicate the extreme importance of both natural and artificial reefs to the economy of Monroe County and to the quality of life of Keys residents and visitors.

As the number one economic industry in Monroe County, tourism generates 3.11 million visitors who spend over 13 million days per year annually (Johns et al. 2001). The vast majority of these trips are for recreation activities. Recreation activities include boating, SCUBA diving and snorkeling, fishing, visiting beaches, sailing, touring historical attractions, and outdoor exercise. In addition to tourists, Monroe County maintains a resident population of 79,941 (Johns et al. 2001). In 2000, there were 26,638 registered recreational boats, or approximately 1 boat for every 4 residents. Of the area's residents and visitors, 43% visited either a natural or an artificial reef during the period between June 2000 and May 2001. This resulted in over 2.0 million separate boating person trips to one of these areas. Over 90 % of these trips were undertaken for

either recreational fishing, diving, or snorkeling. The economic contribution of the reefs generated by these activities was calculated to be $1.395 billion for the period described above.

Recreational fishing and boating are the only significant recreational activities known to occur in the area of the proposed sinking location. Boating activities are generally limited to transit through the area en route from one location to another. Recreational fishing is limited to trolling for pelagic species. The area is not known to be a frequent target for recreational fishers.

2.3.2 Commercial Fishing

Next to tourism, commercial fishing comprises the largest industry in Monroe County. It contributed $17 million to the local economy in 1990 and comprised approximately 20% of Florida's total gross earnings from commercial fishing. The diversity of the Keys' aquatic habitats provides food and shelter for 90% of the region's commercially important species. Active fisheries include decapod crustaceans (shrimp, stone crab, and spiny lobster), snapper species, grouper species, king mackerel, and spanish mackerel. Commercial harvest is regulated through management plans developed by the South Atlantic and Gulf of Mexico Fishery Management Councils, the Florida Fish and Wildlife Conservation Commission and the Florida Cabinet. The State of Florida and the National Marine Fisheries Service collect landing data on approximately 400 kinds of fish, invertebrates, and plants harvested in Monroe County. Refer to Volume II of the FKNMS Management Plan for an extensive discussion on commercial fishing and additional information (DOC 1996).

There is little to no commercial fishing activity at the proposed sinking location of the Vandenberg. The habitat in this area does not support commercially important species. Limited hook and line fishing through trolling for mackerel and dolphin may occur in or around the area, however, the area is not known to support the commercial fishing industry on a routine basis.

2.4 SUBMERGED CULURAL RESOURCES

The Florida Keys have a high concentration of shipwrecks due to many factors including high shipping concentrations over a long period of time, shallow water depth, and the existence of natural hazards. Because the Straits of Florida have been part of trade routes for centuries, shipwrecks found in the area represent the full spectrum of maritime history in the New World. The north running currents in the Straits mean that southbound vessels will often come dangerously close to the reefs to avoid having to battle the sometimes 3 to 4 knot current. Given the abundant shallows, rapid decrease in depth on the fore reef, low land profile, and the fact that the Florida Reef Tract was unmarked prior to 1825, the Florida Keys have been a traditionally difficult area to navigate. In addition, the prevalence of hurricanes in the Keys has influenced the number of ships wrecked. At least two Spanish flotillas were wrecked by hurricanes, giving the Florida Keys the largest concentration of 18th-century Spanish shipwrecks in the Americas.

The area of the proposed sinking was investigated for the presence of submerged cultural resources through literature searches, remote sensing, and diver surveys. Historic shipwreck records and the location of previously unreported cultural material have been compiled by the

FKNMS. ARK contacted the Monroe County May Hill Russell Library. According to Mr. Tom Hambright, "I have searched the holdings in the Florida History Department of the Monroe County Library for any shipwreck or other submerged cultural resource in the area of your proposed artificial reef. These holding include extensive information about shipwrecks on the Florida Reef. I did not find any submerged cultural resource at the proposed artificial reef site". These sources indicate extremely limited potential for the presence of submerged cultural resources in the proposed sink area. Most historic shipwrecks occurred in shallow reef areas due to navigational errors or storm events that forced vessels on to the reefs where they grounded and many times sunk or were broken apart. Given the depth of the proposed sinking location (1140'), cultural material associated with a historic shipwreck would likely have been moved into the area due to storm events and/or currents washing material from the proximate shallow reefs to this deeper area. Any shipwrecks or cultural material originating at this location would likely be significantly large in size, be relatively consolidated due to the protection of depth, and readily identifiable during visual and remote sensing surveys of the area.

During the period from 1997 – 2004, FKNMS staff and others made approximately 170 dives to the sinking location. On approximately 50 of these dives, individuals attempted to locate cultural material as part of the FKNMS submerged resource inventory and for use in evaluating the sinking location of the Vandenberg. No cultural material was observed during these excursions. Considering that the sandy nature of the bottom could readily conceal artifacts, ARK members initiated a magnetometer survey of the recommended sinking location and surrounding 750' radius buffer area.

3.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

3.1 INTRODUCTION

This analysis describes the environmental and socioeconomic consequences of implementing the preferred alternative and the no-action alternative and is focused on the potential effects to Sanctuary resources and uses. A more comprehensive analysis of consequences was prepared by the ACOE prior to their issuing the regional general permit for artificial fishing reefs in Florida waters (SAJ-50).

3.2 ALTERNATIVE 1: PROPOSED ACTION

3.2.1 Physical Environment

Direct Effects. Placement of the 520' vessel. Vandenberg, on the bottom in this location would alter the seabed directly below the vessel through the compaction of sediments and by blocking the ability of sunlight to reach this approximately 40,000 square foot area. The bathymetric signature of the area would also be altered, creating, in effect, a 100' vertical bottom feature for a length of 520'. Given the amount of sand habitat in this and other areas within FKNMS there would be no significant impact to Sanctuary resources by this activity (the addition of this structure would have a negligible affect on the amount of sand habitat available in the FKNMS). Current regimes would not be significantly affected beyond occasional shielding of substrate on one side of the vessel dependent on current direction, which is variable in the area.

Indirect Effects. The FKNMS does not expect there to be any indirect effects to the physical environment.

3.2.2 Biological Resources

Direct Effects. The placement of the Vandenberg would displace or destroy a variety of infaunal, epifaunal, and fish species directly below the sinking location. None of these species are threatened, endangered or subject to special protective measures. There would be no significant impact to the overall populations of these animals in the Sanctuary.

Indirect Effects. The placement of the Vandenberg will create complex vertical structure in an area where none currently exists, providing habitat for a diverse array of marine species. This will likely result in an increase in the local diversity and abundance of numerous species of fish, invertebrates, and plants. Other artificial reefs found in FKNMS support reef fish assemblages similar to natural reefs and have been colonized by numerous species of marine plants and corals.

The potential effects of the artificial reef to fish populations in surrounding, natural reef areas is unclear from the scientific literature. Generally, studies focused on determining the effects of artificial reefs on adjacent reef fish populations have found short-term declines in the abundance of certain species on the adjacent reefs with corresponding recruitment of these species to the artificial reef. Longer-term studies describe eventual return to previous abundance levels on the adjacent natural reefs. A potential indirect effect to Sanctuary resources could be the movement of fish species from the natural reefs to the artificial reef, thus impacting the reef fish community structure in these areas. No significant long-term declines in reef fish populations have been attributable to existing artificial reefs within FKNMS. This concern will be addressed in the conditions of the FKNMS permit for this activity through a requirement to monitor fish populations on the Vandenberg and at surrounding natural reef areas. Data collected and analyzed as a result of this activity will be useful to FKNMS and other resource managers in determining the impacts of artificial reefs on the fishery resources.

Artificial reefs are known to attract recreational divers and fishermen. A potential positive effect of this alternative is the reduction of user pressure on surrounding natural reefs. This may provide an overall reduction of impacts associated with divers and fishermen in natural reef areas of FKNMS (e.g., groundings, trampling). A potential negative impact of the artificial reef may be the attraction and concentration of fish species that are subsequently targeted by recreational fishermen to the area.

Large military vessels similar to the Vandenberg contain a variety of hazardous materials that are known to be detrimental to marine organisms. These include hydrocarbons, heavy metals, mercury, and PCBs found in equipment, wiring, and electrical transformers. There is potential for introduction of these pollutants into the proposed sinking area. The ACOE permit requires certification by the United States Environmental Protection Agency (EPA) and State of Florida that the vessel is free of these and other contaminants. Therefore, there would be no significant impact to biological resources from pollutants stemming from the proposed alternative.

3.2.3 Socioeconomic Resources

Direct Effects. There have been extensive studies and associated reports generated on the socioeconomic condition of the Florida Keys in relation to both natural and artificial reefs. A recent socioeconomic study of the reefs in Southeast Florida (Johns et al. 2001) included a comprehensive socioeconomic evaluation of natural and artificial reefs in Monroe County, FL. It indicates the extreme importance of both natural and artificial reefs to the economy of Monroe County and to the quality of life of Keys residents and visitors. According to the study, in 2000, there were 26,638 registered recreational boats, or approximately 1 boat for every 4 residents. Of the area's residents and visitors, 43% visited either a natural or an artificial reef during the period between June 2000 and May 2001. This resulted in over 2.0 million separate boating person trips to one of these areas. Over 90 % of these trips were undertaken for recreational fishing, diving, or snorkeling. The economic contribution of the reefs generated by these activities was calculated to be $1.395 billion for the period described above. Based on the Johns et al. (2001) socioeconomic study, there are likely to be positive effects to the local (Key West)

economy generated by the Vandenberg artificial reef in that the artificial reef will support and enhance the recreational diving experience for visitors to and residents of the Key West area.

Indirect Effects. The FKNMS does not expect any indirect effects to the socioeconomic resources of the area.

3.2.4 Submerged Cultural Resources

Direct Effects. Per the Submerged Cultural Resources assessment described in section 2.4 of this document, no cultural or archeologically significant material is located in the area of the proposed artificial reef. Therefore, the FKNMS does not anticipate any direct effects to submerged cultural resources.

Indirect Effects. The Vandenberg is an ex-military vessel of historic interest. Positive, indirect effects may result from its placement within the FKNMS as the vessel will provide educational opportunities related to submerged cultural resources and may alleviate diving pressure on more sensitive cultural sites within the Sanctuary. ARK is hoping to be able to engage in educational and research activities associated with the development of the reef on the Vandenberg. Although these activities would not be part of the existing Permits or the FKNMS authorization of issuance of a permit, should ARK be able to secure funding for these ancillary activites, the FKNMS would be consulted during development of these project to evaluate the need for input of additional permits or approvals.

3.3 ALTERNATIVE 2: DIFFERENT LOCATION

The following was considered when selecting the proposed location as compared to alternate locations. These factors, relative to the evaluation of alternate locations, would produce a reef that is less desirable as a fishing and diving destination, as well as, depending on the alternate location selected, not as vibrant and diverse an ecosystem resulting at the alternate reef location.

- Alternate locations both within the FKNMS that meet the criteria of depth, seafloor composition, minimal current, and good visibility, are not as easily accessible from Stock Island and Key West marinas. In interviews with charter boat captains and the propeller club, most boats do less than 20 knots and run half-day charters. This is the bulk of day-to-day use of the reefs in and around Key West. In interviews with FKNMS personnel use of a large ship artificial reef located south of the main reef tract between western sambos ecological preserve and sand key would be very accessible location for many charter boat captains.
- Alternate locations may not be available that have the hard pan sand bottom observed at the selected location.
- Alternate locations were not as flat as the selected location. The gentle grade of the selected location allows placement of a 520 feet plus vessel, while maintaining clearance for navigation by providing a consistent depth below the surface.
- Research and project monitoring is more feasible with an easily accessible location. This makes monitoring at the selected location more practical that at other locations.

- The depth of the selected location is ideally suited for the Vandenberg based on a 100 Feet of profile for the vessel. This will make the reef accessible to a larger number of divers, snokelers, and fishermen than a reef in an alternate location where the depth to reach the reef would be greater. Locations outside the sanctuary are all considered to be too deep for an attractive dive reef.

3.3.1 Physical Environment

Direct Effects. Placement of the 520' vessel Vandenberg, on the bottom in an alternate location would alter the seabed directly below the vessel through the compaction of sediments and by blocking the ability of sunlight to reach this approximately 40,000 square foot area. The bathymetric signature of the area would also be altered, creating, in effect, a 100' vertical bottom feature for a length of 520'. Given the amount of sand habitat in other areas within the FKNMS and outside the FKNMS there would be no significant impact to Sanctuary resources by this activity (the addition of this structure would have a negligible affect on the amount of sand habitat available in the FKNMS). Current regimes would not be significantly affected beyond occasional shielding of substrate on one side of the vessel dependent on current direction, which is variable in most areas.

Indirect Effects. The FKNMS does not expect there to be any indirect effects to the physical environment. Possible indirect effects on the physical environment within the FKNMS by selecting an alternate location would be the physical effects to the natural resources from users traveling to and using the different location, and possibly more continued use of the natural reefs by divers and fishermen as opposed to the proposed project in alternative 1.

3.3.2 Biological Resources

Direct Effects. Since any alternate location would most likely be selected with the same seabed features as the selected location. The placement of the Vandenberg would displace or destroy a variety of infaunal, epifaunal, and fish species directly below the sinking location. The exact species present may vary slightly based on the location selected. However, none of the species expected to be in this type of environment within the FKNMS or just outside of the FKNMS are threatened, endangered or subject to special protective measures. There would be no significant impact to the overall populations of these animals in the Sanctuary.

Indirect Effects. Regardless of the location, the placement of the Vandenberg will create complex vertical structure in an area where none currently exists, providing habitat for a diverse array of marine species. The development of this reef ecosystem will result in an increase in the local diversity and abundance of numerous species of fish, invertebrates, and plants. Other artificial reefs found in FKNMS support reef fish assemblages similar to natural reefs and have been colonized by numerous species of marine plants and corals.

If the alternate location were to be within the Sanctuary, a potential indirect effect to Sanctuary resources could be the movement of fish species from the natural reefs to the artificial reef, thus impacting the reef fish community structure in these areas. No significant long-term declines in reef fish populations have been attributable to existing artificial reefs within FKNMS.

Artificial reefs are known to attract recreational divers and fishermen. A potential positive effect of this alternative is the reduction of user pressure on surrounding natural reefs. This may provide an overall reduction of impacts associated with divers and fishermen in natural reef areas of FKNMS (e.g., groundings, trampling). This positive effect is thought to be less positive in an alternate location than in the selected location, because all the alternate locations available would be less accessible and could, depending on the conditions at the location create a less diverse reef ecosystem. A potential negative impact of the artificial reef may be the attraction and concentration of fish species that are subsequently targeted by recreational fishermen to the area.

Large military vessels similar to the Vandenberg contain a variety of hazardous materials that are known to be detrimental to marine organisms. These include hydrocarbons, heavy metals, mercury, and PCBs found in equipment, wiring, and electrical transformers. There is potential for introduction of these pollutants into the proposed sinking area. The ACOE permit requires certification by the United States Environmental Protection Agency (EPA) and State of Florida that the vessel is free of these and other contaminants. Therefore, there would be no significant impact to biological resources from pollutants stemming from the proposed alternative.

3.3.3 Socioeconomic Resources

Direct Effects. Based on the Johns et al. (2001) socioeconomic study, there are likely to be positive effects to the local (Key West) economy generated by the Vandenberg artificial reef in that the artificial reef will support and enhance the recreational diving experience for visitors to and residents of the Key West area. This positive would be diminished if a less desirable location were to be selected for the artificial reef.

Indirect Effects. The FKNMS does not expect any indirect effects to the socioeconomic resources of the area.

3.3.4 Submerged Cultural Resources

Direct Effects. Per the Submerged Cultural Resources assessment described in section 2.4 of this document, no cultural or archeologically significant material is located in the area of the proposed artificial reef. Therefore, there could be cultural or archeologically significant material in alternate locations; although it is unlikely such a location would be selected.

Indirect Effects. The Vandenberg is an ex-military vessel of historic interest. Positive, indirect effects may result from its placement within the FKNMS, as the vessel will provide educational opportunities related to submerged cultural resources and may alleviate diving pressure on more sensitive cultural sites within the Sanctuary. This positive effect would be diminished if an

alternative location were selected, since alternate locations reviewed are not as desirable for educational opportunities based on accessibility.

3.4 ALTERNATIVE 3: DIFFERENT MATERIALS FOR REEF CONSTRUCTION

The following was considered when selecting the proposed location as compared to alternate locations. These factors were considered in evaluating alternate materials of construction would produce a reef that is less desirable as an eco-tourism destination, as well as, depending on the alternate construction materials selected, not as vibrant and diverse an ecosystem resulting at the alternate reef location.

- Shipwrecks are preferable to divers over natural reefs and other artificial reef materials.
- A large ship reef will provide more complexity and relief in the water column that alternate materials.
- The complexity of structure, "swiss cheese preparation methods, and higher profile in the water column will enable more light to reach the upper portion of the vessel, more water to flow through the vessel, and greater alternatives for habitats within the vessel that most alternative materials. These advantages of the proposed alternative will support a wider array of invertebrate species for colonization as well as providing a preferred habitat for many vertebrate species. This should provide for the best artificial reef development and be a more attractive destination for fishers and divers.
- The mass of the ships, and in particular this ship, make it much more stable the other alternate materials.
- The proposed material provides a wider array of training, education, and research opportunities as compared to alternative materials.

3.4.1 Physical Environment

Direct Effects. Placement of the alternate materials on the bottom in the same proposed location would alter the seabed directly below the alternative material in the same manner as the proposed material through the compaction of sediments and by blocking the ability of sunlight to reach the area to be covered by the alternate material. This effect would be greater or lesser that the proposed alternative depending on the area proposed to be covered by the alternate material as compared the approximately 40,000 square feet proposed to be covered by the proposed alternative. The bathymetric signature of the area would also be altered less than the proposed materials if the alternative material had less profile that the proposed alternative. Given the amount of sand habitat in other areas within the FKNMS and outside the FKNMS there would be no significant impact to Sanctuary resources by this activity (the addition of any material would have a negligible affect on the amount of sand habitat available in the FKNMS). Current regimes would not be significantly affected beyond occasional shielding of substrate on one side of the vessel dependent on current direction, which is variable in most areas.

Indirect Effects. The FKNMS does not expect there to be any indirect effects to the physical environment.

3.4.2 Biological Resources

Direct Effects. The vessel will provide both small and large interstices. Units with both small and large interstices for fishes would more closely approximate natural conditions and result in even more diverse and interesting fish assemblages (Kruer and Causey 1992). Most material to create artificial reefs do not provide as complex a structure or as large a profile as a large ship would. Therefore, the array of species and vibrancy of the reef created by an alternative material could be less using an alternate material depending on the material selected.

Indirect Effects. Regardless of the material used there would be some horizontal and vertical structure in an area where none currently exists, providing habitat for marine species. The development of this reef ecosystem will result in an increase in the local diversity and abundance of numerous species of fish, invertebrates, and plants. Other artificial reefs found in FKNMS support reef fish assemblages similar to natural reefs and have been colonized by numerous species of marine plants and corals.

If the alternate location were to be within the Sanctuary, a potential indirect effect to Sanctuary resources could be the movement of fish species from the natural reefs to the artificial reef, thus impacting the reef fish community structure in these areas. No significant long-term declines in reef fish populations have been attributable to existing artificial reefs within FKNMS.

Artificial reefs are known to attract recreational divers and fishermen. A potential positive effect of this alternative is the reduction of user pressure on surrounding natural reefs. This may provide an overall reduction of impacts associated with divers and fishermen in natural reef areas of FKNMS (e.g., groundings, trampling). This positive effect may be diminished if an alternate material were placed in the selected location, because all the alternate materials would be less attractive to divers and create a less diverse reef ecosystem. A potential negative impact of the artificial reef may be the attraction and concentration of fish species that are subsequently targeted by recreational fishermen to the area.

There would be no significant impact to biological resources from pollutants stemming from appropriately selected alternative materials used.

3.4.3 Socioeconomic Resources

Direct Effects. Based on the Johns et al. (2001) socioeconomic study, there are likely to be positive effects to the local (Key West) economy generated by the Vandenberg artificial reef in that the artificial reef will support and enhance the recreational diving experience for visitors to and residents of the Key West area. This positive would be diminished if a less desirable material were to be selected for the artificial reef.

Indirect Effects. The FKNMS does not expect any indirect effects to the socioeconomic resources of the area.

3.4.4 Submerged Cultural Resources

Direct Effects. Per the Submerged Cultural Resources assessment described in section 2.4 of this document, no cultural or archeologically significant material is located in the area of the proposed artificial reef. Therefore, there would be no impact on submerged cultural resource is an alternate material was selected because no resources exist in the proposed location.

Indirect Effects. Positive, indirect effects may result from placement of alternate materials as an artificial reef within the FKNMS, as the reef may alleviate diving pressure on more sensitive cultural sites within the Sanctuary. This positive effect would be diminished if an alternative material were selected, since alternate materials are not as attractive to divers as ship reefs.

3.5 ALTERNATIVE 4: NO ACTION ALTERNATIVE

Because the Vandenberg would not be sunk as an artificial reef under this alternative, the FKNMS does not anticipate any significant direct or indirect effects to the environment or area's resources. Failure to issue a permit would not allow the artificial reef to be placed within the boundaries of the FKNMS. Furthermore, because the seaward boundary of the FKNMS extends beyond depths accessible to recreational SCUBA divers (the boundary generally follows the 300-foot isobaths), placing the ship on the seabed outside of the Sanctuary is not an option that would meet the objectives of the project. To meet the objectives of the project, the artificial reef must be placed at depths within recreational diving limits and within a reasonable traveling distance of Key West.

4.0 OTHER LAWS AND AUTHORITIES CONSIDERED

4.1 EXECUTIVE ORDER 13089: CORAL REEF PROTECTION

Executive Order (EO) 13089 requires all Federal agencies whose actions may affect U.S. coral reef ecosystems to: (1) identify their actions that may affect U.S. coral reef ecosystems; (2) utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and (3) ensure that any actions they authorize, fund, or carry out will not degrade the conditions of such ecosystems.

The FKNMS has considered EO 13089 and has determined that, while it may affect U.S. coral reef ecosystems in the Florida Keys, the proposed action (alternative 1) will not degrade the conditions of any U.S. coral reef ecosystem, including the coral reef ecosystems in the Florida Keys. The FKNMS permit has several controls and conditions that will ensure protections for natural coral reefs in the vicinity of the project site. The FKNMS permit, like the Army Corps of Engineers permit, requires that the Vandenberg be placed on sandy bottom in manner that would not affect nearby coral reefs. In addition, the monitoring (socio-economic and fish sampling) is designed to provide important information about the use of artificial reefs and their ability to alleviate visitation pressure on natural coral reefs. This information will be very useful in making future management decisions about U.S. coral reef ecosystems, and could be used to protect and enhance the conditions of such ecosystems in the future.

4.2 EXECUTIVE ORDER 13112: INVASIVE SPECIES

EO 13112 requires each Federal agency whose actions may affect the status of invasive species to, among other things, not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.

Under the proposed action, the Vandenberg would be towed by tugboats from its current location in Virginia along the east coast of the Southeastern United States to the proposed sinking location. All vessels used to tow the Vandenberg to the Florida Keys would be U.S. flagged and would not be taking on ballast in foreign ports prior to entering the Keys ecosystem. The risk of invasion by aquatic nuisance species is therefore minimal. The FKNMS does not consider the proposed action (alternative 1) to be one that will affect the status of an invasive species.

4.3 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT-ESSENTIAL FISH HABITAT

The project site for the proposed action (Alternative 1) is comprised of sand bottom habitat and a portion of the surrounding water column, both identified as Essential Fish Habitat (EFH) by the South Atlantic Fishery Management Council (SAFMC). Surveys of the project site reveal that the sand bottom habitat is inhabited by invertebrate infauna, burrowing fish, and bottom-dwelling fish, none of which are managed species by the SAFMC. No sensitive marine life has been identified in the area, and no adverse direct impacts to the species present are expected. In addition, no commercial fishery in the Florida Keys uses this habitat type exclusively for any commercially caught species (DOC 1996). Secondary, cumulative, or synergistic impacts are not expected as a result of the proposed action because a vast amount of similar sand habitat will remain unimpacted directly adjacent to the artificial reef and throughout the remainder of the Sanctuary.

The surrounding water column will be altered as a result of the proposed action through the deployment of an artificial reef which will create vertical structure and relief where none previously existed. Pelagic fishes that utilize the project site are not expected to be directly impacted by this activity because individual animals will avoid the region during and immediately after deployment. It is further expected that no adverse secondary or cumulative effects will occur within the water column. More likely, pelagic species utilizing this habitat will benefit from the proposed action because the artificial reef will provide structure and habitat for prey species that had not previously recruited to the area.

In addition to sand and water column habitats, the FKNMS, Florida Fish and Wildlife Conservation Commission, and ARK have gone to great lengths to ensure that the proposed action would not have any adverse direct or indirect effects on other natural habitats in the

vicinity of the project site, such as coral reefs and seagrass beds. There is the potential for positive impacts on nearby coral reef habitats from the artificial reef if it reduces human visitation to and thereby relieves pressure on the natural reef. A monitoring program is being undertaken in conjunction with the deployment of the artificial reef to ascertain whether these potential benefits are realized over time. Because of these findings, the FKNMS has determined that the proposed action will have no adverse short- or long-term effects on any designated EFH and therefore did not prepare an EFH Assessment.

4.4 COASTAL ZONE MANAGEMENT ACT- FEDERAL CONSISTENCY

This bit needs a rewrite

The proposed action (alternative 1) is a federally licensed or permitted activity for the purposes of the Coastal Zone Management Act (CZMA). On April 12, 2002 the Florida Department of Community Affairs (DCA) was requested to review the proposed action for consistency with the enforceable policies of its coastal zone management program. The DCA has submitted the project to the intra-State agency clearinghouse process to solicit comments from other State agencies that might be affected by the proposed action. If the FKNMS permit is listed in the in the Florida Costal Management Plan as one of those Federally licensed or permitted activities that require a consistency determination, the FKNMS will not execute the proposed action (i.e., will not issue the permit to the City of Key West) until the DCA concurs with the City of Key West's consistency certification or concurrence is presumed. See 15 CFR § 930.62. Tiny, I think DCA reviewed and commented on the original ACOE permit but I'm not sure. I think we got a letter from them way back saying that teir only requirement was a four point anchoring system. I think this was to be required post-sinking. I've got Sheri looking, but it may be in Paul Kruger's file at ACOE.

4.5 ENDANGERED SPECIES ACT

The FKNMS has determined that the proposed action will not affect any species listed as endangered or threatened under the Endangered Species Act and will not affect any critical habitat for any species listed as endangered or threatened. The Vandenberg will be positioned over the sinking coordinates and will be sunk by cutting charges, but they still make a smallish boom in the vessel's interior. (No explosives will be used in the sinking process) I think this claim needs a bit of wordsmithing. FKNMS, City of Key West, and Florida Fish and Wildlife Conservation Commission staff will be onsite during the sinking and will be monitoring the area for endangered and threatened species and will halt the sinking if one is found within the area such that it might be affected by the sinking. Staff from the FKNMS will coordinate with staff from the Southeast Region of the National Marine Fisheries Service to ensure that no threatened or endangered species will be affected by the proposed action.

5.0 REFERENCES

Beeker, Charles. 1997. Upper Keys Region Florida Keys National Marine Sanctuary Hayes Cultural Resource Report. Underwater Science and Educational Resources Indian University, Bloomington, Indiana.

Johns, Grace M., V.R. Leeworthy, F.W. Bell, and M.A. Bonn. 2001. Socioeconomic Study of Reefs in Southeast Florida. Final Report from Hazen and Sawyer Environmental Engineers and Scientists.

Kruer, Curtis R. and Causey, Laura G. The Use of Large Artificial Reefs to Enhance Fish Populations at Different Depths in the Florida Keys, Florida Keys Artificial Reef Association, Inc., July 1992

NOAA's ARCH. 1996. National Marine Sanctuaries Archaeological Database, Sanctuaries and Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration, Silver Spring, Maryland.

U.S. Department of Commerce. 1996. Final Management Plan/Environmental Impact Statement. Volumes I through III. Department of Commerce, Washington D.C.

6.0 LISTING OF AGENCIES AND PERSONS CONSULTED

Federal Agencies

United States Coast Guard

United States Army Corps of Engineers

Paul Kruger
Colonel, U.S. Army
District Engineer

United States Environmental Protection Agency

Stuart Perry
EPA Region IV

United States Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service

State of Florida Agencies

Jon Dodrill
Florida Fish and Wildlife Conservation Commission Artificial Reef Program

Bill Horn
Florida Fish and Wildlife Conservation Commission Artificial Reef Program

City of Key West

Jimmy Weekley
Mayor

Julio Avael
City Manger

Raymond Archer
Director of Port Operations

Involved Citizens

Joe Weatherby and Jeffrey C. Dey
Principals – REEFMAKERS, Inc.

Artificial Reefs of the Keys, Inc.

7.0 LIST OF PREPARERS

8.0 FINDING OF NO SIGNIFICANT IMPACT

NOAA Administrative Order (NAO) 216-6 (revised May 20, 1999) provides eleven criteria for determining the significance of the impacts of a proposed action. These criteria are discussed below with respect to the proposed action (alternative 1):

1. Impacts may be both beneficial and adverse -- a significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

Neither the beneficial nor the adverse effects of the proposed action are expected to be significant. The proposed action includes a monitoring program that is designed to assess the true nature of the effects of artificial reefs on natural habitat, however, it is not meant to balance any adverse effects of the proposed action.

2. What is the degree to which public health or safety is affected by the proposed action?

Public health and safety will not be affected by the proposed action. While the artificial reef authorized by the proposed action will be used by SCUBA divers, the FKNMS does not expect the creation of this artificial reef in and of itself will result in any danger to the health and safety of the public. In addition, because the highest point on the artificial reef will be 40 feet below the surface, the proposed action is not likely to create a hazard to navigation. Finally, as discussed in section 2.3.2, there is no commercial bottom trawling in the area that would be affected by the placement of the artificial reef.

3. Are there unique characteristics of the geographic area in which the proposed action is to take place?

While the coral reef ecosystem of the Florida Keys is unique as compared to other coral reefs in the world, the site of the proposed action is not unique to the Florida Keys. Sandy habitat is very common in the area.

4. What is the degree to which effects on the human environment are likely to be highly controversial?

The effects to the human environment are expected to be positive (refer to section 3.2.3 for a discussion of the socioeconomic impacts). Therefore, the effects are not at all likely to be controversial amongst the residents of the Florida Keys. Conversely, the no-action alternative (alternative 2) is expected to be highly controversial based on newspaper articles and the overwhelming support for this project that has been expressed to the FKNMS by the recreational diving community in the Florida Keys

5. What is the degree to which effects are highly uncertain or involve unique or unknown risks?

Several artificial reefs have been created in the waters off the Florida Keys to date and none have had scientifically measurable significant impacts on natural ecosystems. Therefore, the creation of an additional artificial reef is not expected to create any unknown or unique risks. However, the benefits of artificial reefs on adjacent natural systems are not fully understood by the scientific community. The monitoring programs that will be implemented by NOAA and the project proponent (Monroe County) are designed to answer some of these questions.

6. What is the degree to which the action establishes a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

The FKNMS has already issued two authorizations for the creation of similar artificial reefs in the past. Therefore, this action does not set a precedent. Furthermore, the monitoring program required by the permit will answer some outstanding questions about the effects of artificial reefs on natural systems and will allow the FKNMS to make more informed decisions about similar projects in the future.

7. Does the proposed action have individually insignificant but cumulatively significant impacts?

The proposed action is expected to have individually insignificant impacts. The cumulative impacts of several artificial reefs along the Florida Keys reefs tract are not entirely understood but are not expected to be significant based on observations of existing artificial reefs. The monitoring program is designed to answer questions about the cumulative impacts of these projects.

8. What is the degree to which the action adversely affects entities listed in or eligible for listing in the National Register of Historic Places, or may cause loss or destruction of significant scientific, cultural, or historic resources?

The proposed action will not adversely affect any entity listed in or eligible for listing in the National Register of Historic Places. Nor will the proposed action cause the loss of or destroy any significant scientific, cultural, or historic resources. Refer to section 2.4 for a discussion of the lack of cultural resources in the project area.

9. What is the degree to which endangered or threatened species, or their critical habitat as defined under the Endangered Species Act of 1973, are adversely affected?

The proposed action is not within any habitat that has been designated as critical for the survival of any endangered or threatened species. The FKNMS has determined that the proposed action will not affect any species listed as endangered or threatened under the Endangered Species Act. The FKNMS has coordinated with the National Marine Fisheries Service to ensure that the permit issued under the proposed action is conditioned in such a manner to minimize or eliminate any risks posed to threatened or endangered species (refer to section 4.5).

10. Is a violation of Federal, state, or local law for environmental protection threatened?

The proposed action involves the issuance of a permit to the Monroe County (Florida) BOCC to create an artificial reef within the boundaries of the FKNMS. While this activity would otherwise be prohibited by FKNMS regulations (15 CFR 922), it will not violate FKNMS regulations if a permit is issued. Furthermore, the BOCC has already obtained the necessary permission from the ACOE and the State of Florida Fish and Wildlife Conservation Commission for the project.

11. Will the proposed action result in the introduction or spread of a nonindigenous species?

Under the proposed action, the Spiegel Grove would be towed by a tugboat from its current location in Virginia along the East Coast of the Southeastern United States to the proposed sinking location. All vessels used to tow the Spiegel Grove to the Florida Keys will be domestic and would not be taking on ballast in foreign ports prior to entering the ecosystem. The risk of invasion by aquatic nuisance species is therefore minimal. The FKNMS does not consider the proposed action (alternative 1) to be one that will affect the status of an invasive species.

8.1 FONSI STATEMENT

In view of the analysis presented in this document, the proposed creation of an artificial reef off Key Largo, Florida will not significantly affect the quality of the human environment, with specific reference to the criteria contained in Section 6.01 of NAO 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act (NEPA). Accordingly, the preparation of an Environmental Impact Statement for the proposed action is not necessary.

DRAFT

_____ _____

Margaret A. Davidson Date
Acting Assistant Administrator
For Ocean Services and
Coastal Zone Management